Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 1

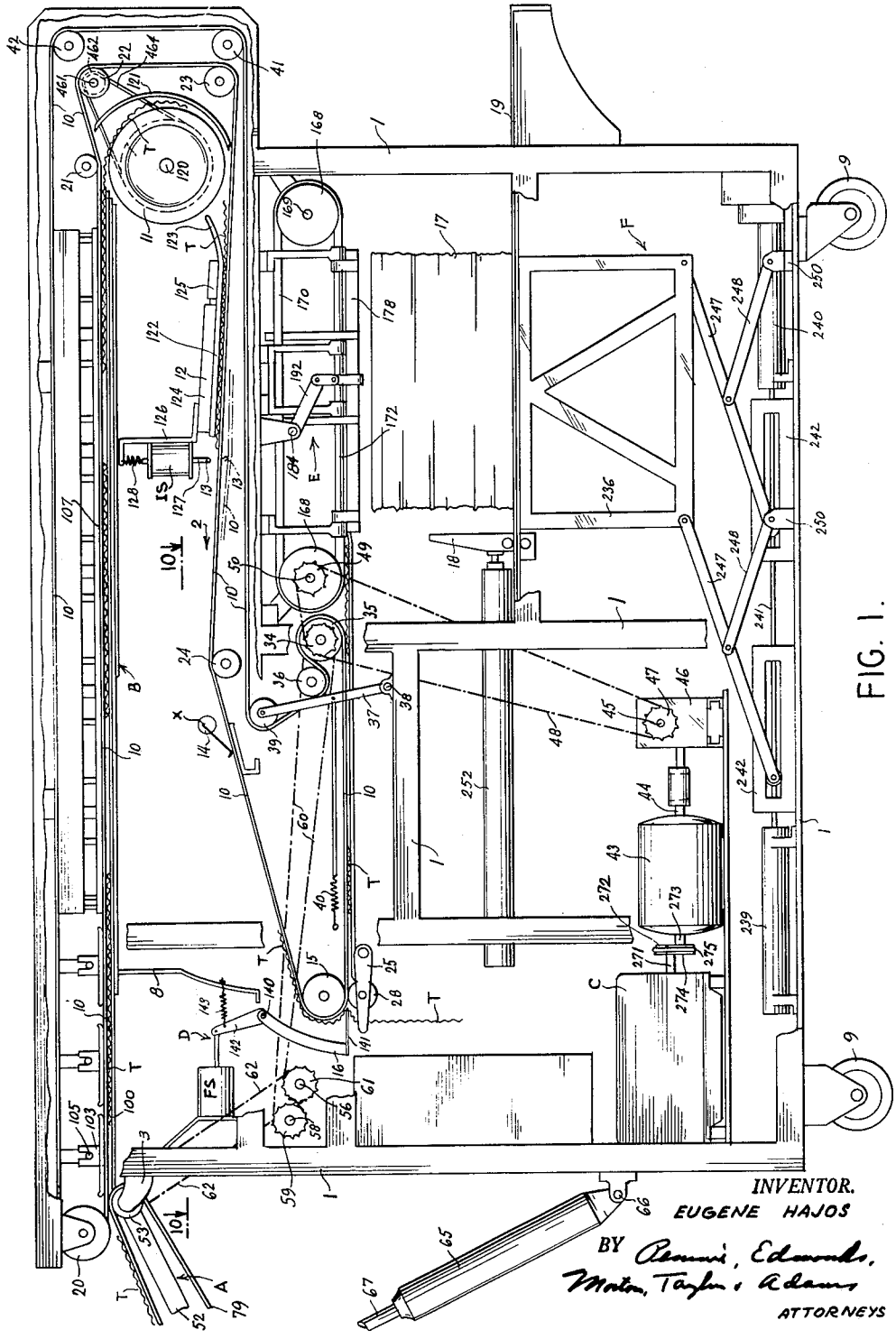


FIG. 1.

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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 2

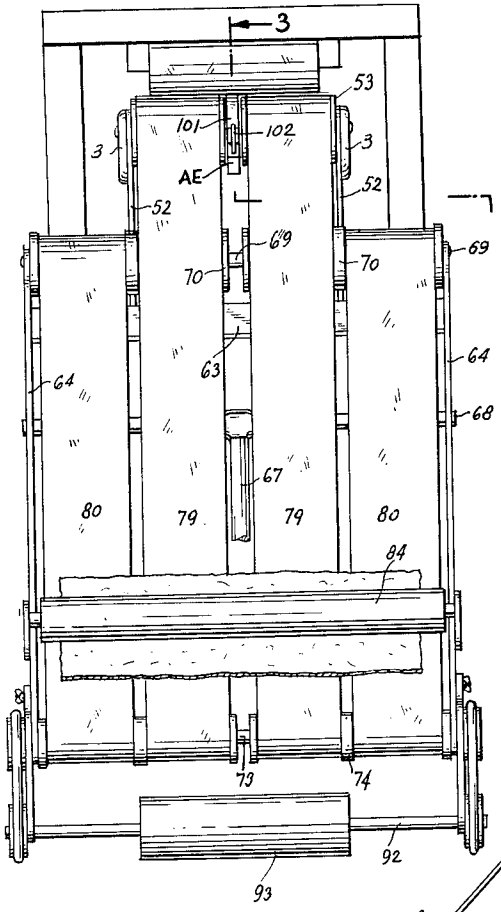
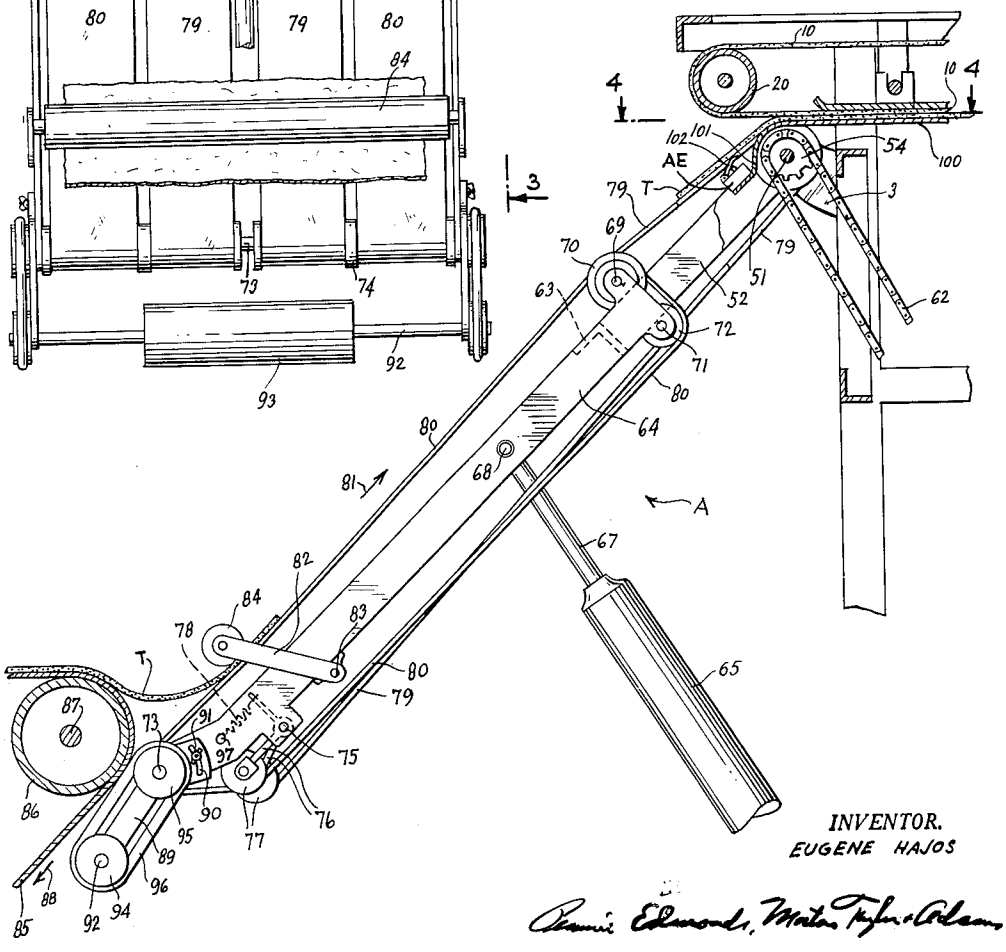


FIG. 2.

FIG. 3.



INVENTOR.
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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 3

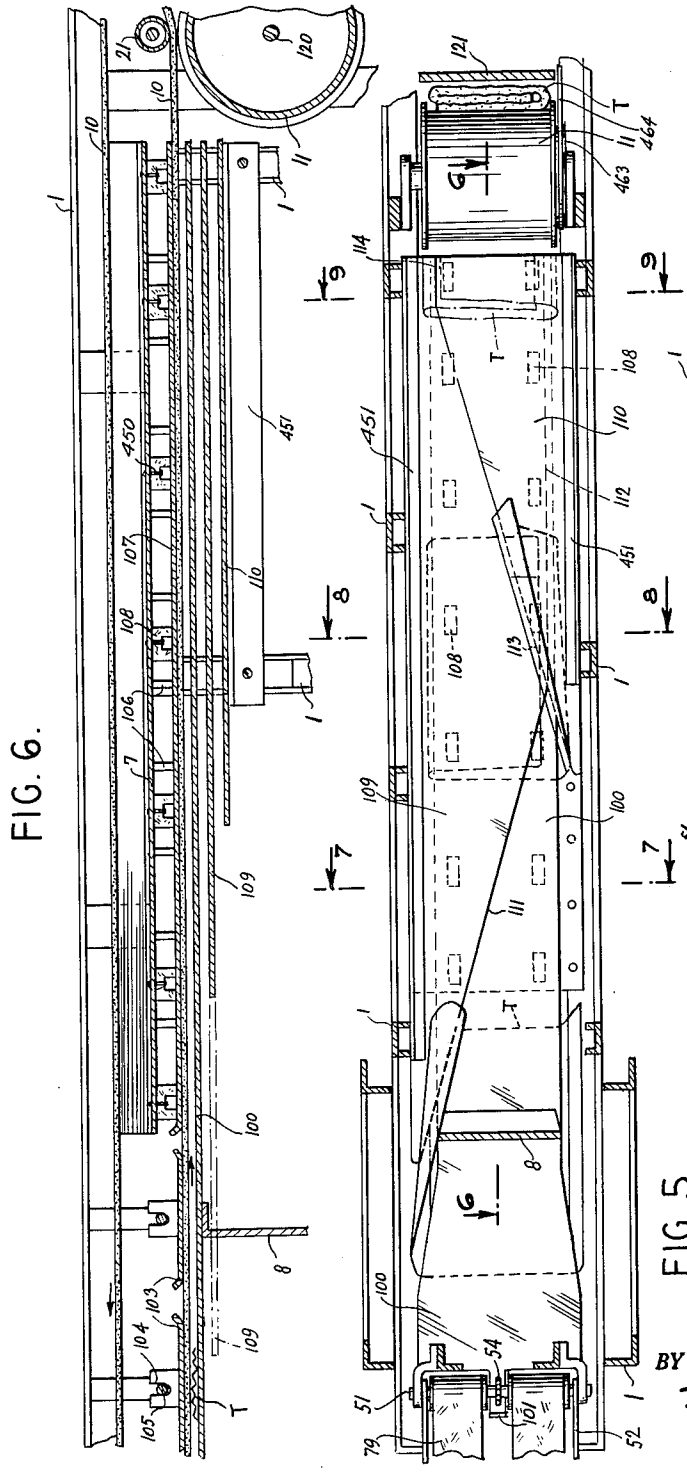


FIG. 6.

FIG. 5.

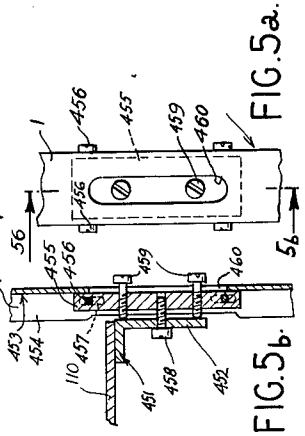


FIG. 5a.

FIG. 5b.

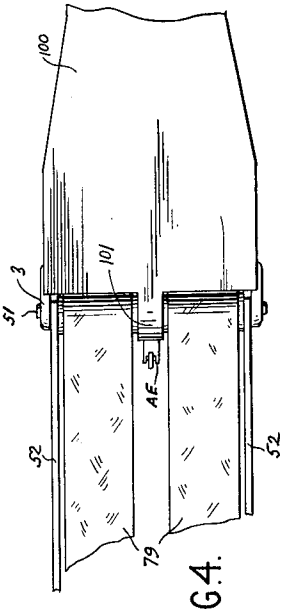


FIG. 4.

INVENTOR.
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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 4

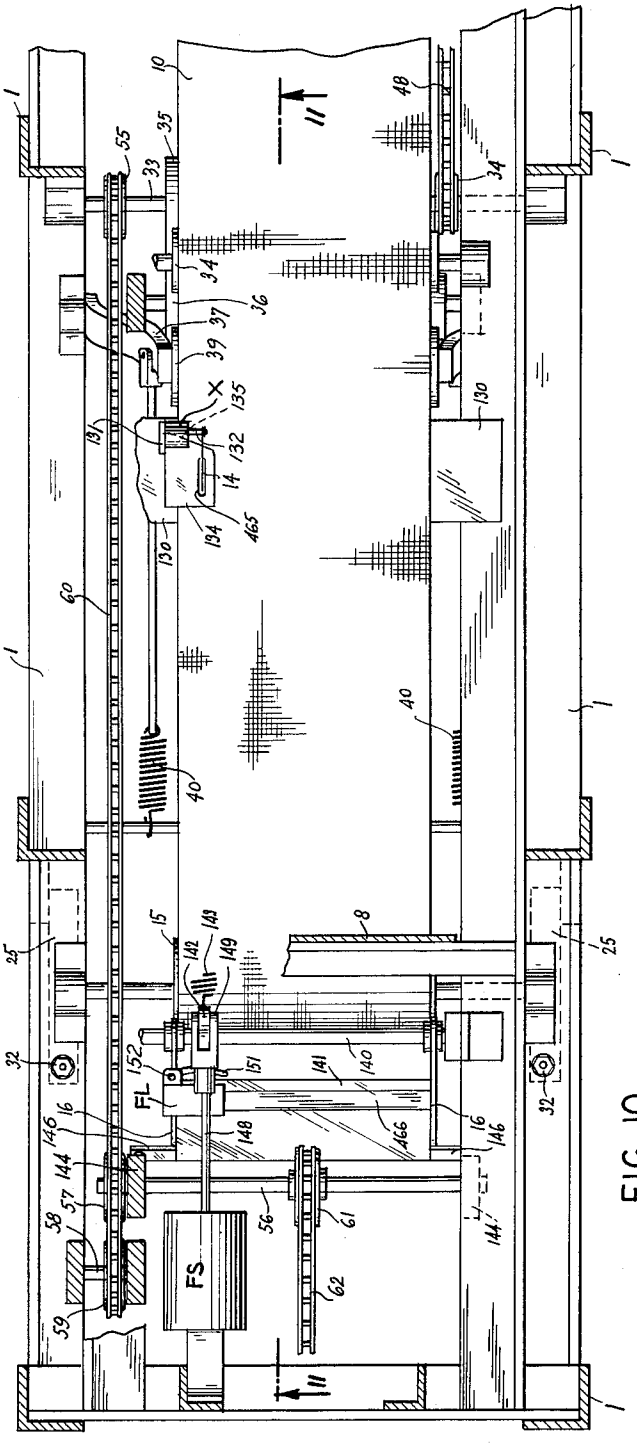


FIG. 10.

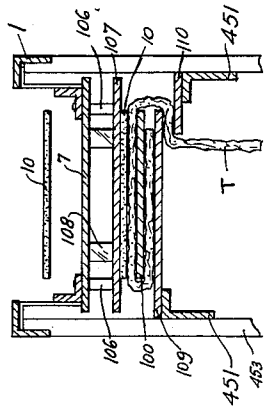


FIG. 8.

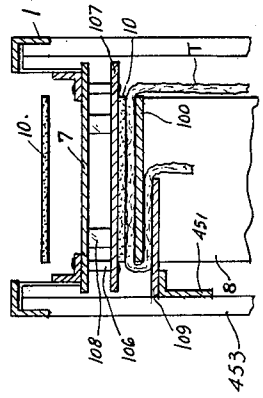


FIG. 7.

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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 5

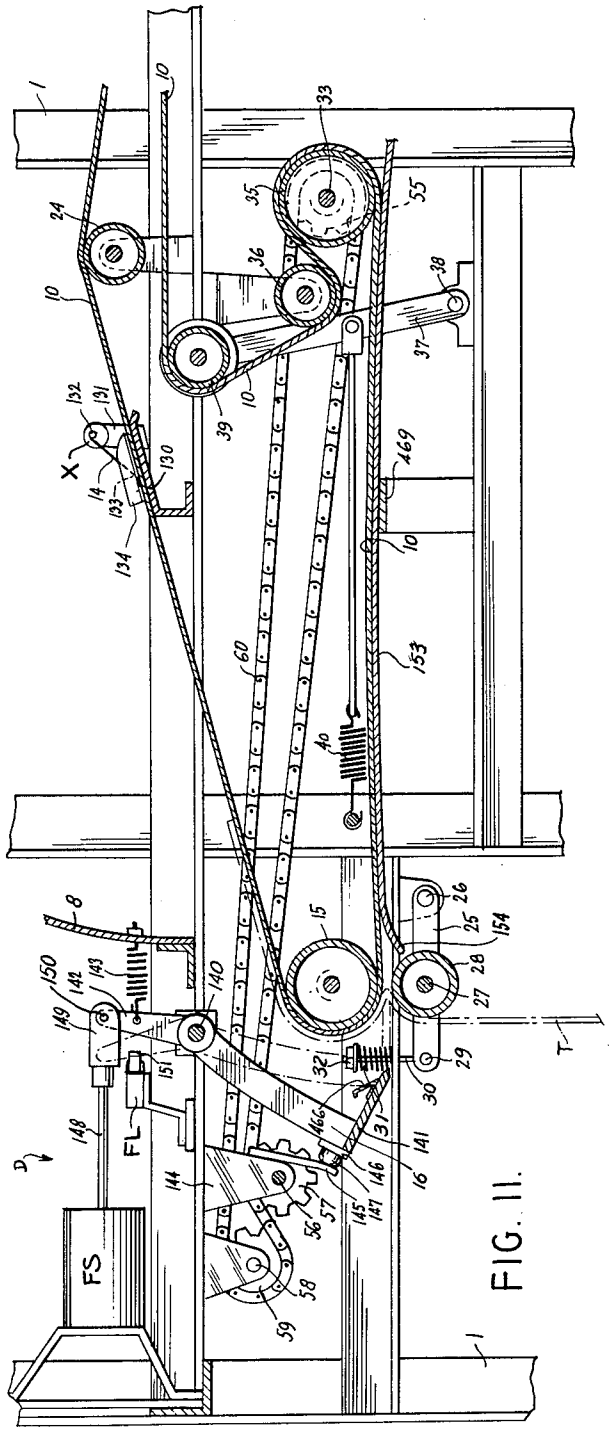


FIG. 11.

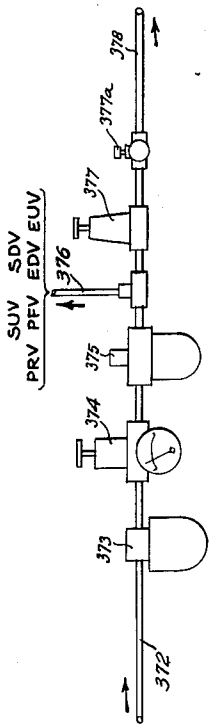


FIG. 18.

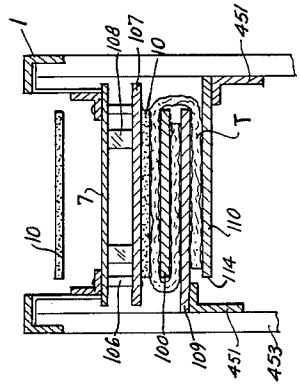


FIG. 9.

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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 6

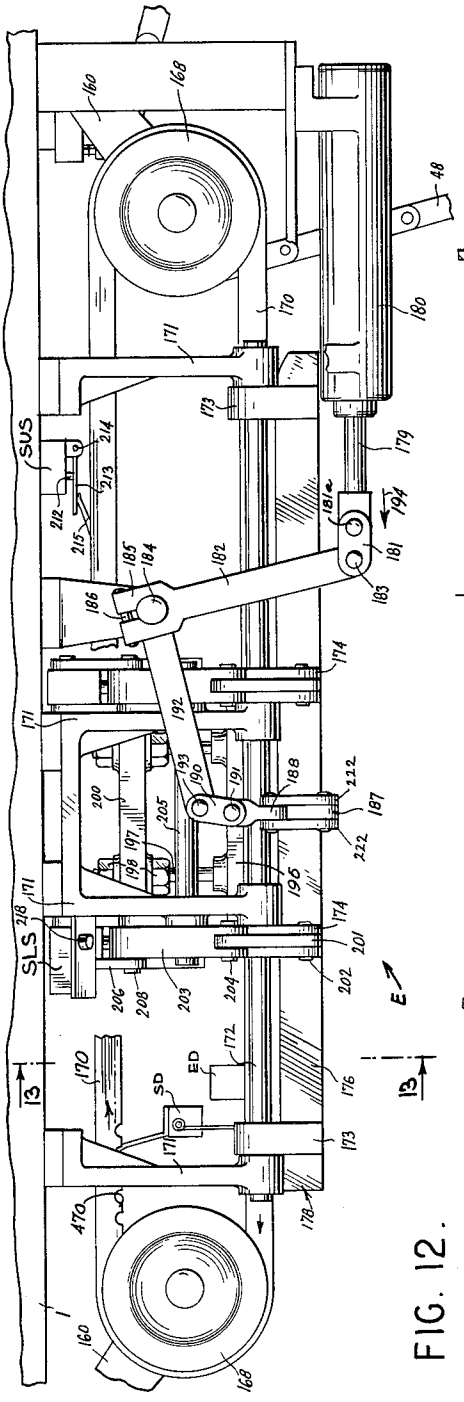


FIG. 12.

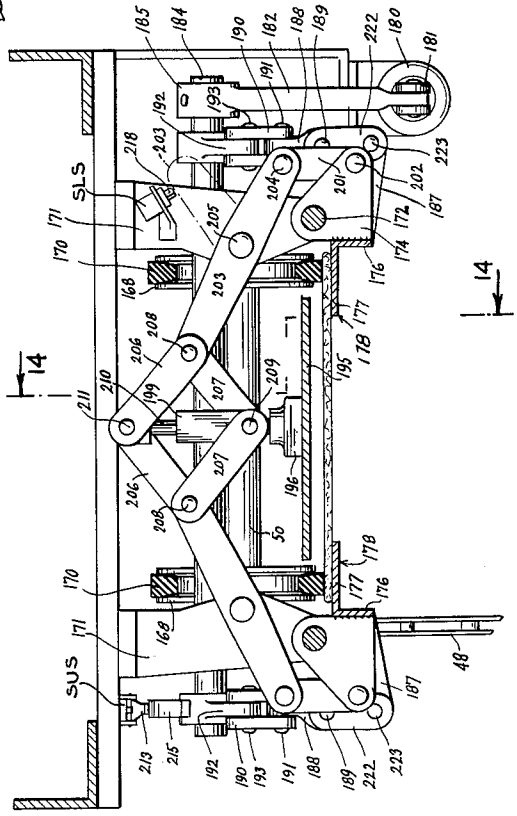


FIG. 13.

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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 7

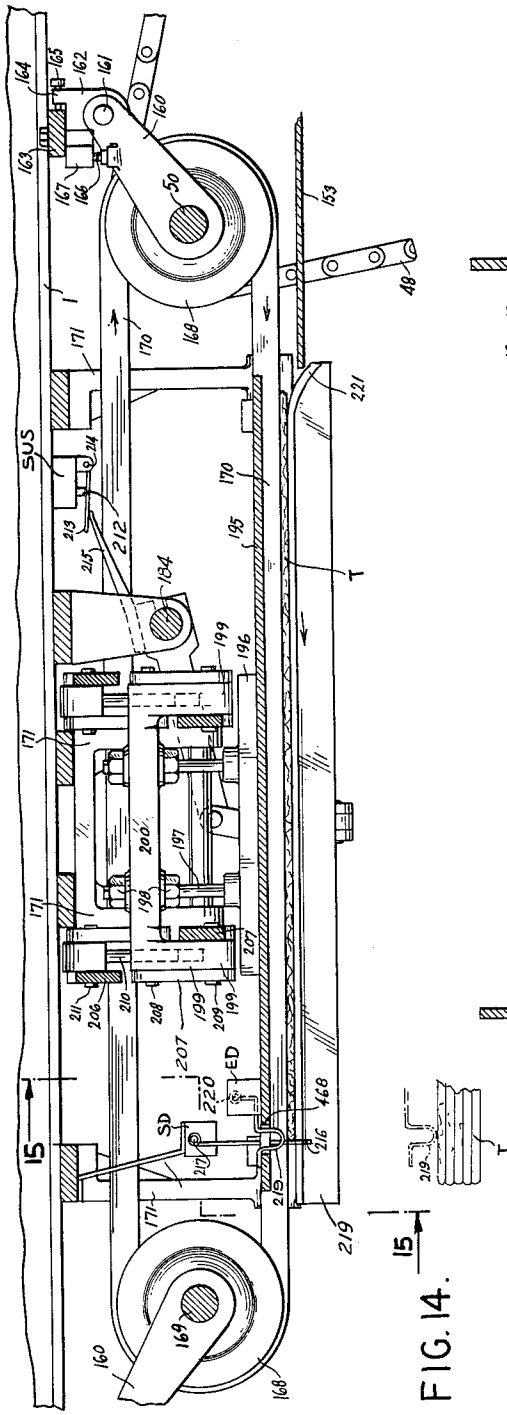


FIG. 14.

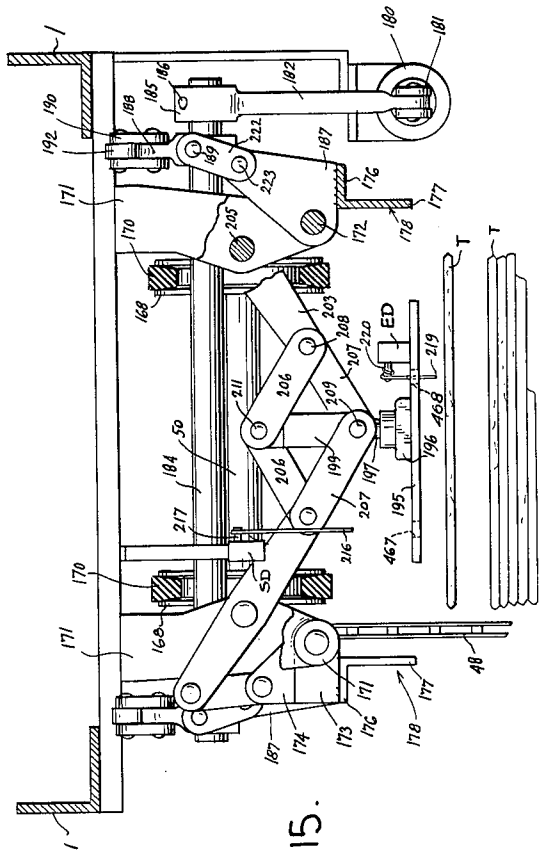


FIG. 15.

INVENTOR.
EUGENE HAJOS

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ATTORNEYS

Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 8

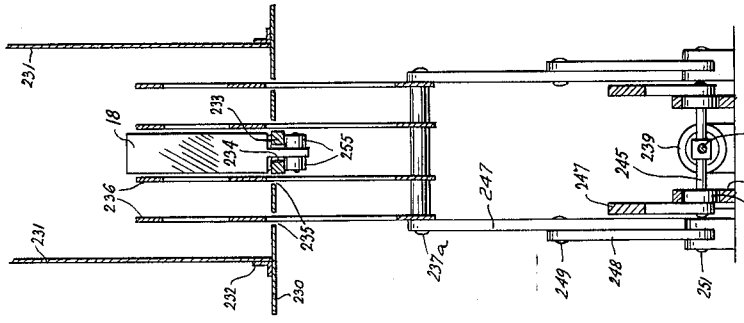


FIG. 17.

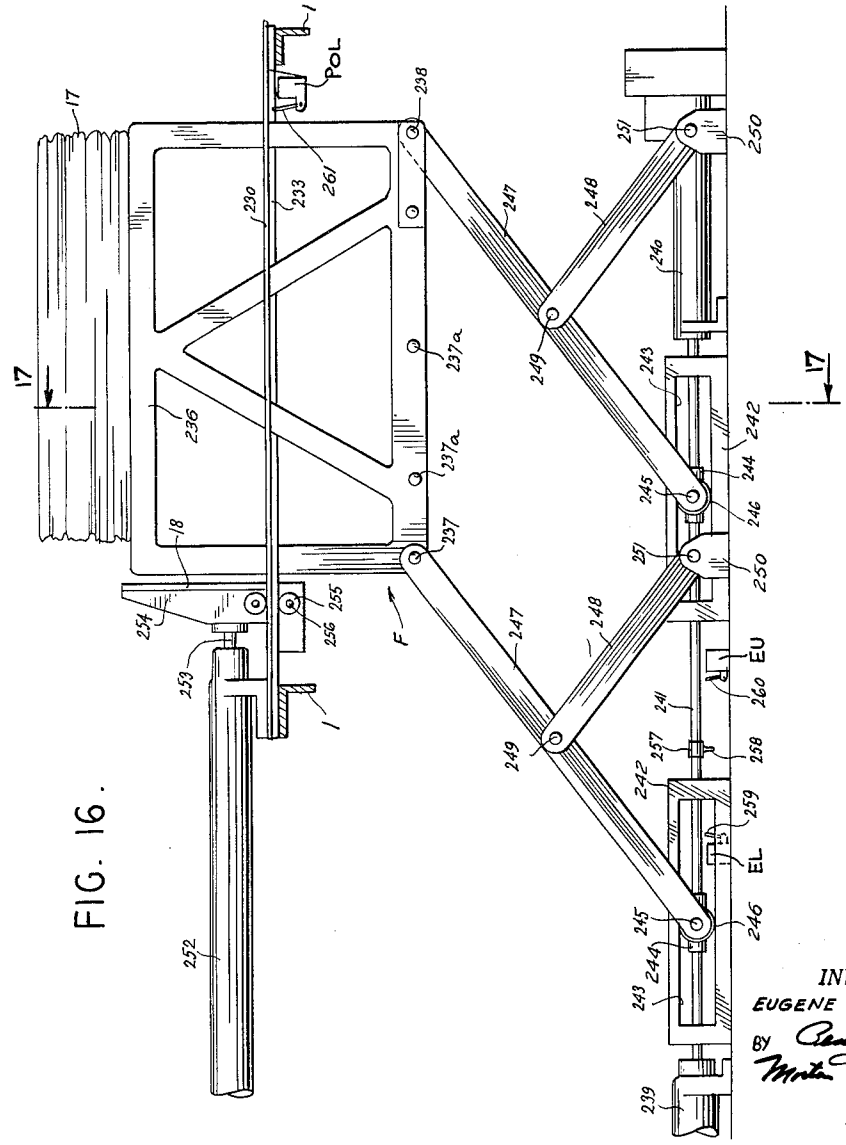


FIG. 16.

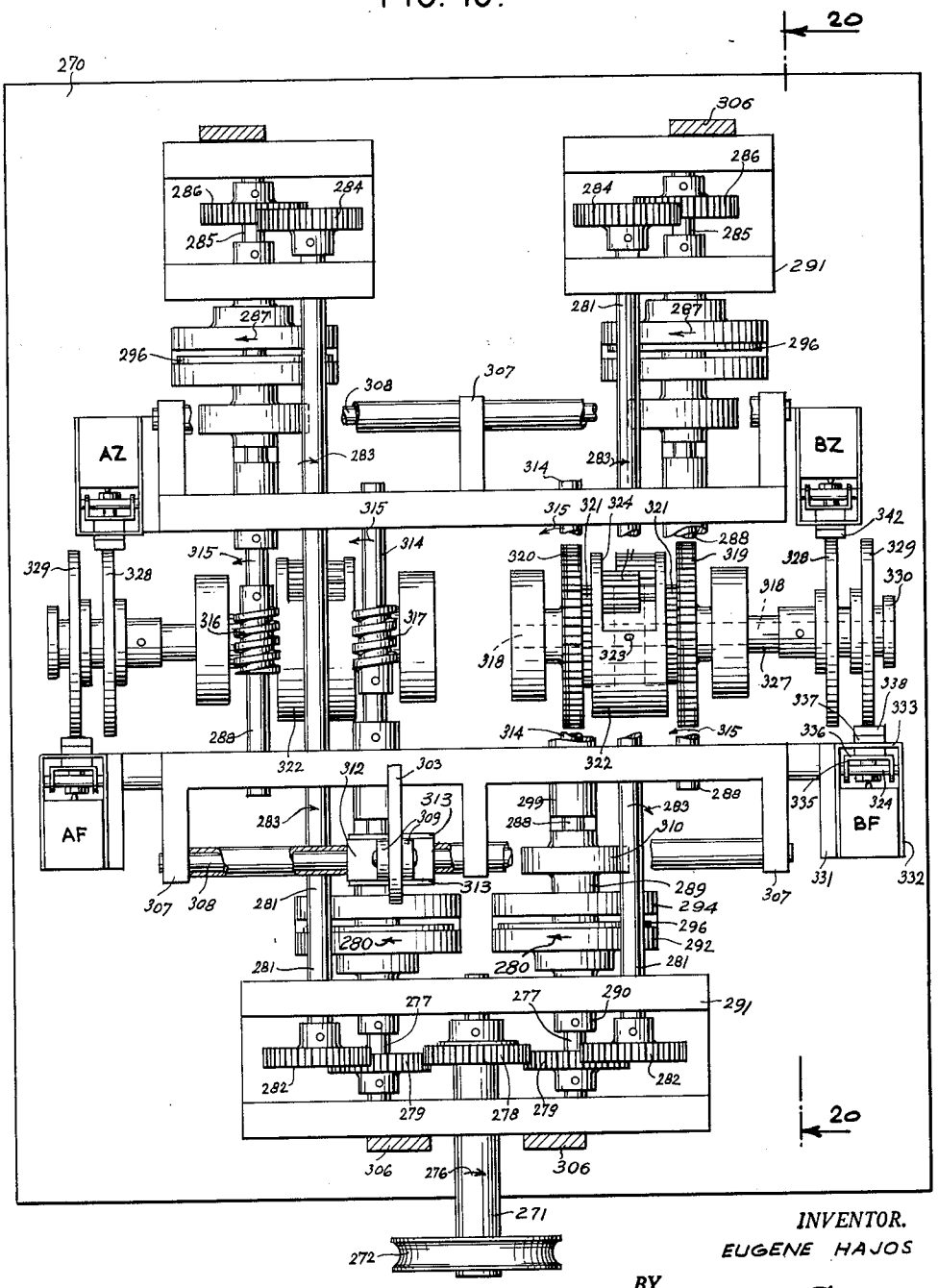
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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 9

FIG. 19.



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FIG. 20.

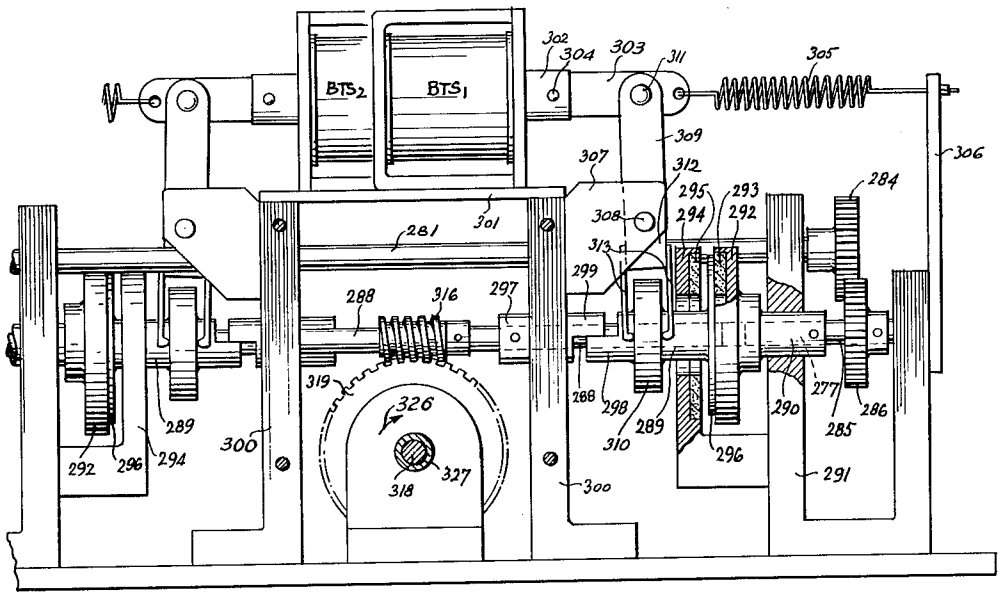


FIG. 22.

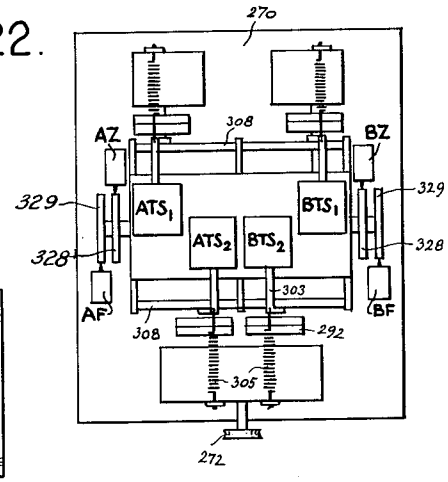
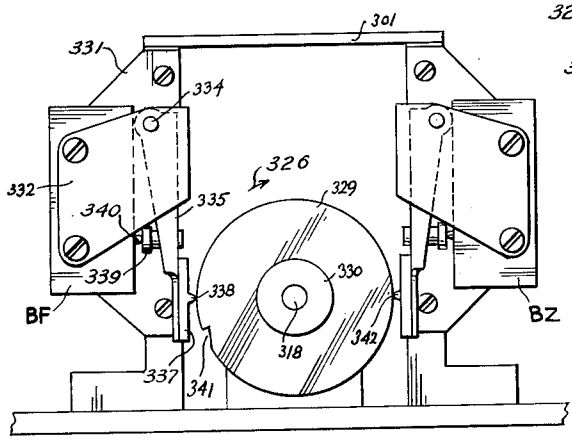


FIG. 21.



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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 11

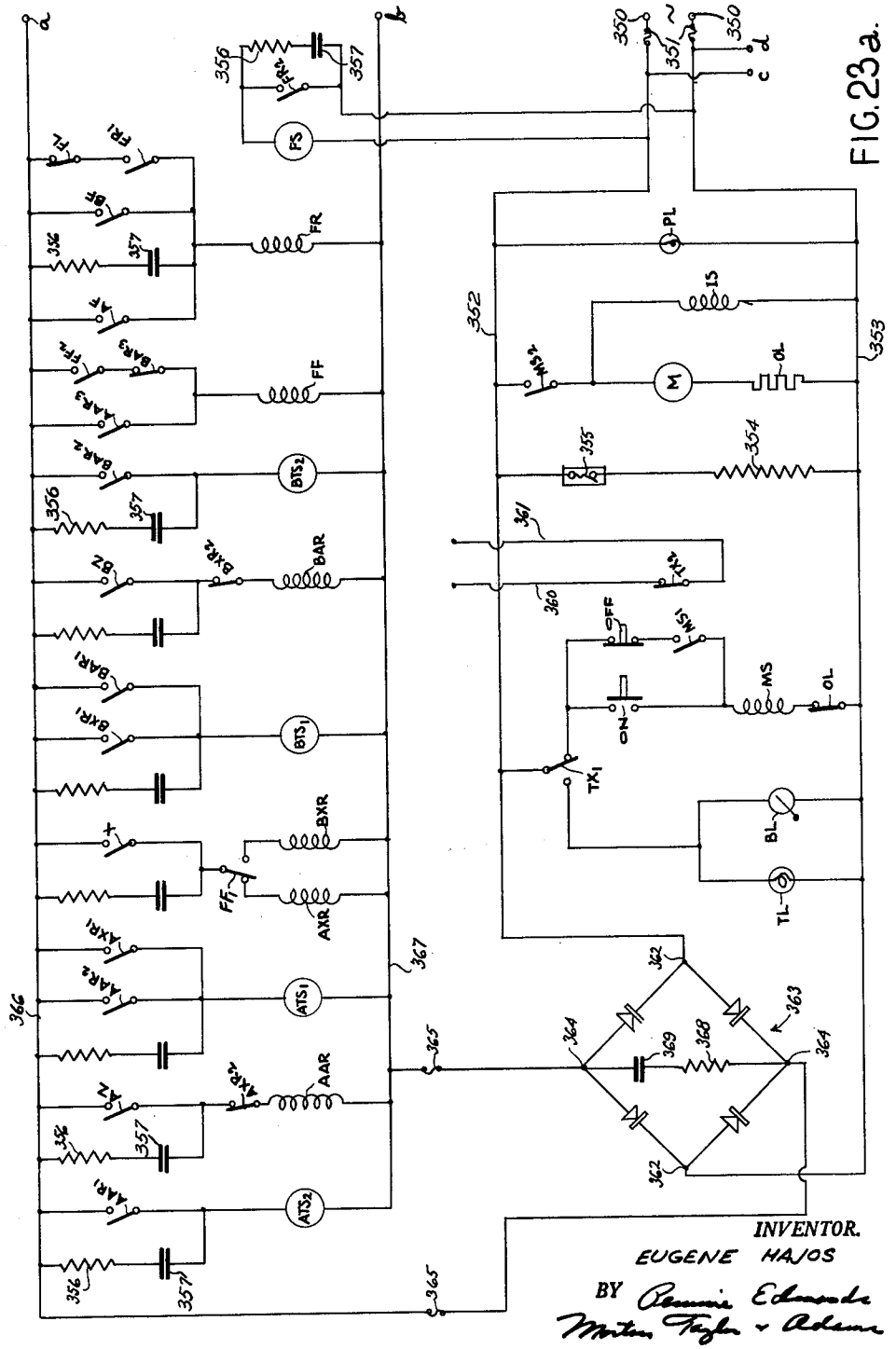


FIG. 23a.

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FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 12

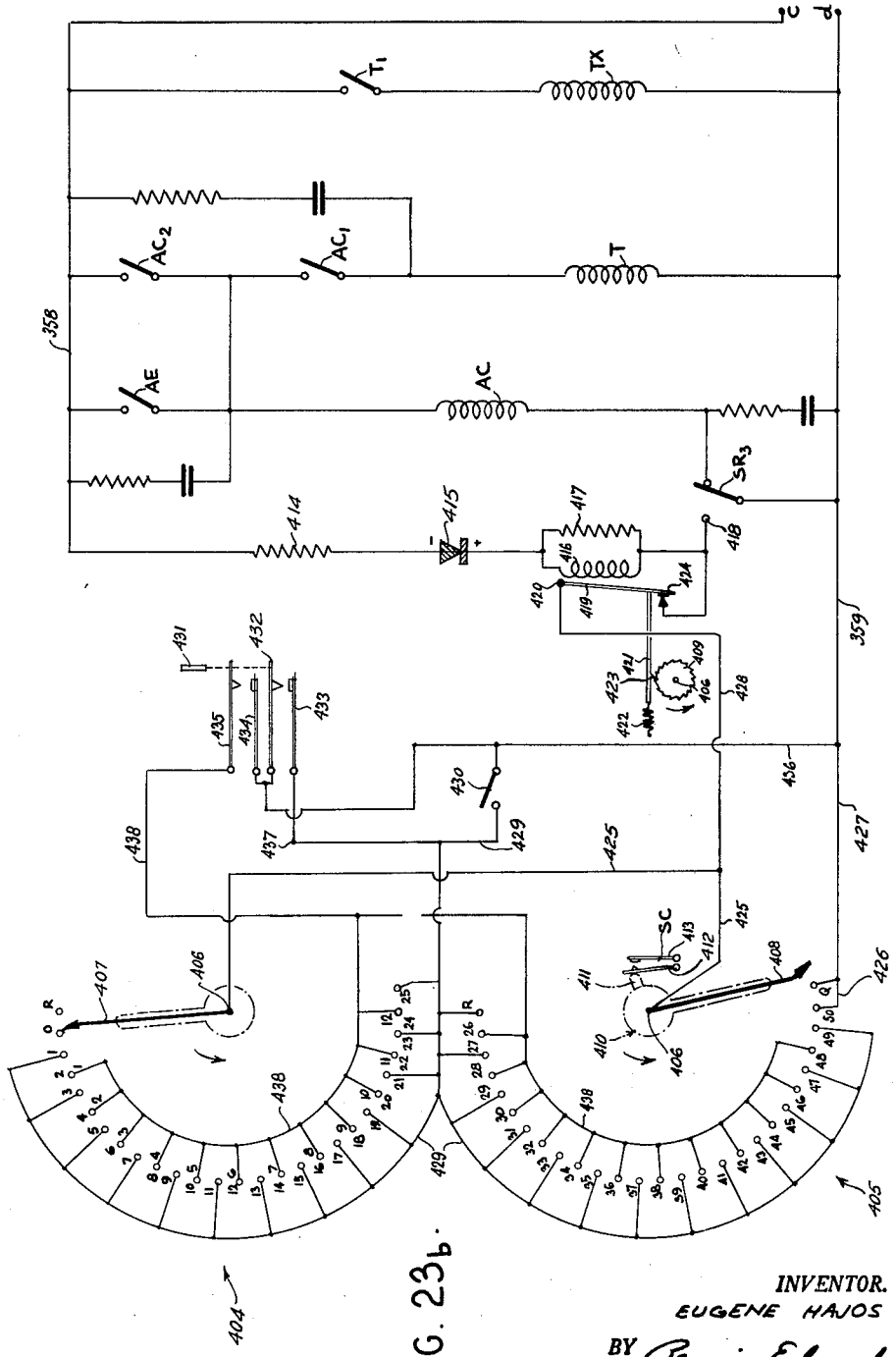


FIG. 23b.

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Sept. 7, 1965 E. HAJOS 3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 13

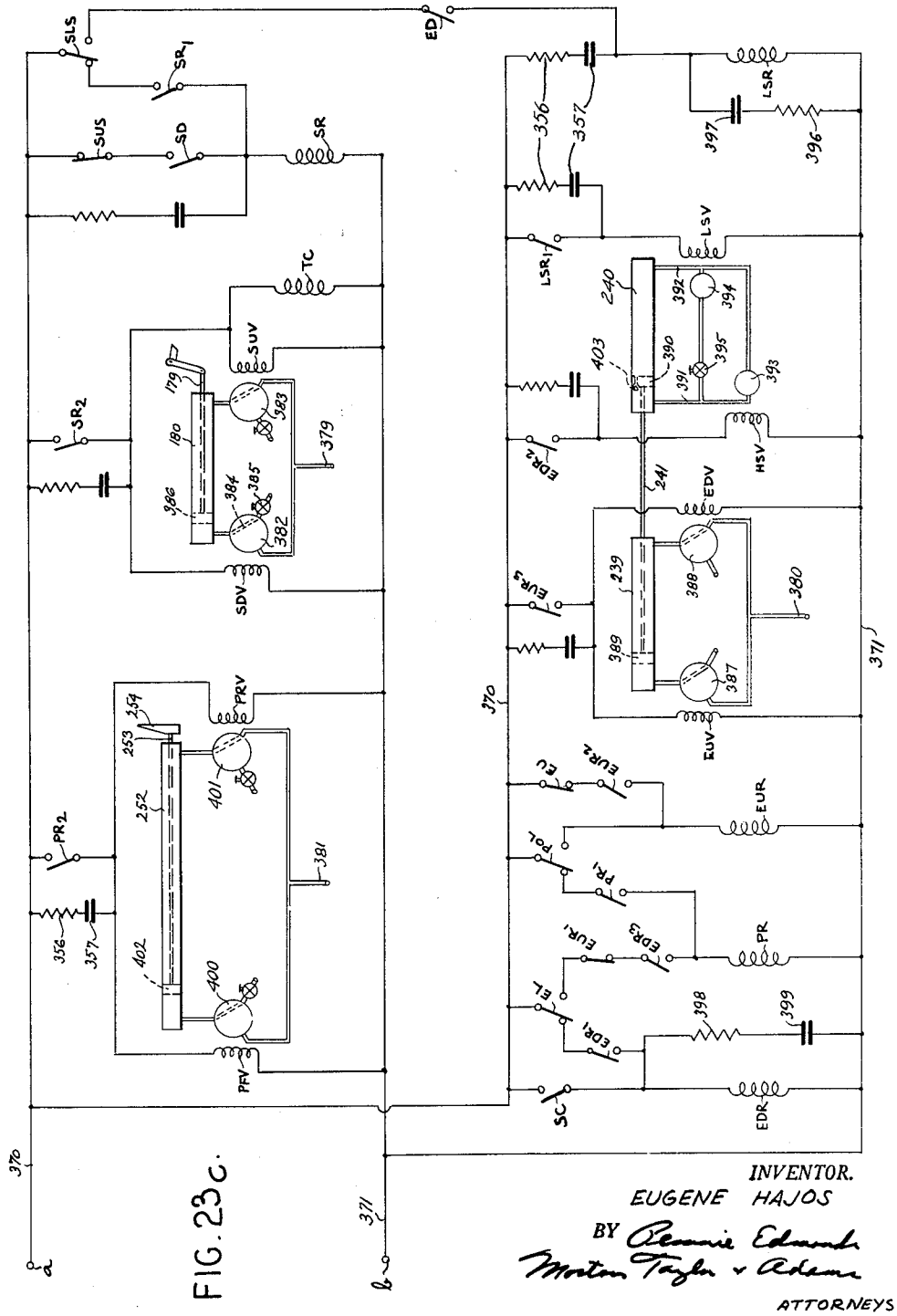


FIG. 23c.

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FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Original Filed May 12, 1953 14 Sheets-Sheet 14

FIG. 24.

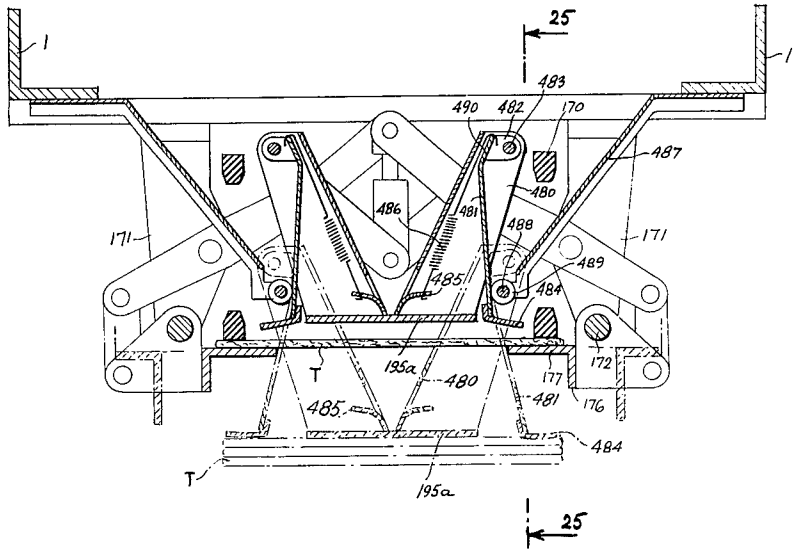
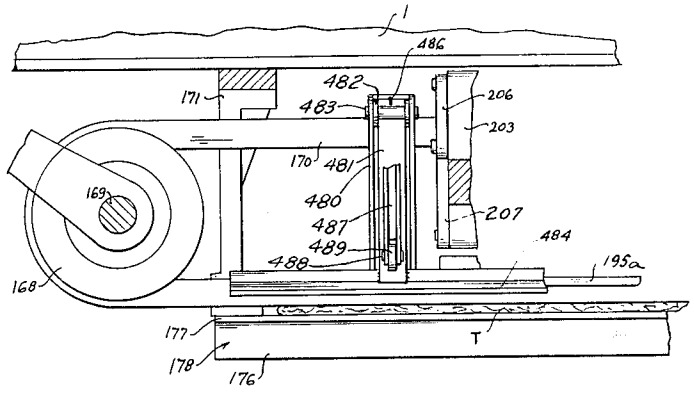


FIG. 25.



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BY

ATTORNEYS

United States Patent Office 3,204,3[illegible]
Patented Sept. 7, 19

3,204,353

FOLDING AND STACKING MACHINES FOR ARTICLES OF LINEN

Eugene Hajos, Fort Lee, N.J., assignor to Premier Laundry, Inc., New York, N.Y., a corporation of New York

Original application May 12, 1953, Ser. No. 354,510, now Patent No. 3,126,657, dated Mar. 31, 1964. Divided and this application Sept. 14, 1961, Ser. No. 146,394
13 Claims. (Cl. 38—7)

This is a division of application Serial No. 354,510, filed May 12, 1953, now Patent No. 3,126,657.

This invention relates to an improved machine for folding articles of linen both along their length and across their length.

An important object of this invention is to provide a machine which will receive ironed articles of linen successively and which will automatically fold these articles along their length into thirds, iron the partly folded articles, complete the folding of the articles by folding them centrally across their length, stack the completely folded articles and eject the articles in stacks containing preselected numbers of articles, ready for wrapping.

The commercial laundry industry has devoted a great deal of effort to the development of new methods and machines for performing the operations involved in the assembly-line laundering of so-called "flat" articles of linen and the like, such as towels, pillow cases and sheets. Some of these operations include washing the articles, drying the articles, ironing the articles, folding the articles, making stacks containing selected numbers of the articles and wrapping the stacks for delivery.

It is well known that the operation of ironing articles of linen has been solved by the development and use on a wide scale of automatic ironing machines. These machines, which are capable of high capacity and efficiency, are accordingly large, complex and costly. However, each ironing machine requires the use of a number of human operators who take the ironed articles and manually feed them to one or more small machines for folding the articles. The articles are stacked from below, and the counting of the stacked articles must be done manually.

The provision of high-speed machines in accordance with the present invention almost entirely eliminates the need for human operators for folding and stacking the articles, and results in more economical laundry operation.

One important feature of the invention resides in the provision of an improved longitudinal folder having a flexible and resilient main plate fixed to the machine frame at its input end and otherwise supported indirectly by magnets, so as to provide uniform driving traction for articles of linen carried on the lower face of the conveyor belt, and having folding plates located below the main plate.

Another important feature of the invention resides in the provision of a change-of-direction roller permitting an abrupt change in the direction of movement of the partly folded articles without wrinkling and thereby permitting compact construction of the machine as a whole.

Another important feature of the invention resides in the provision of an improved timing mechanism for insuring accurate central folding across their length of articles of varying length. The timing mechanism in accordance with this invention has two separate timers for timing the movement of two towels at a time, as a result of which it is possible for articles to follow each other closely upon the conveyor.

Another important feature of the invention resides in the provision of an improved device for stacking the

completely folded articles and in an elevator for receiv the stacks. During stacking, the elevator is always sitioned so as to maintain the stack just below the sta ing device. The elevator is lowered in a series of sh drops as the stack grows. When a selected number articles are stacked, as determined by an automatic cou er, the elevator abruptly drops to its lowest positi and a pusher is actuated to eject the stack from the vator.

Other objects, advantages and features of the inv tion will become apparent from the following desc tion, in conjunction with the annexed drawings, in wh a preferred embodiment is disclosed.

FIG. 1 is a side elevation of a folding and stack machine according to my invention, the front of machine being to the left in this view and the frame input conveyor being partly broken away.

FIG. 2 is a front elevation of the input conveyor the machine of FIG. 1.

FIG. 3 is a side elevation, partly in section, of input conveyor of FIG. 2, taken on the line 3—3 that view, showing it attached to the delivery end of ironing machine.

FIG. 4 is a fragmentary plan view of the upper of the convevor associated with the front of the m frame of the machine, taken on the line 4—4 of FIG

FIG. 5 is a bottom plan view of the longitudinal fol of the machine of FIGS. 1–5.

FIG. 5*a* is a detail view in elevation showing the m ner in which the folding plates are carried by the fra of the machine in an adjustable manner.

FIG. 5*b* is a corresponding view in section, taker right angles to FIG. 5*a*, illustrating the mounting of lower folding plate and taken on the line 5*b*—5*b* FIG. 5*a*.

FIG. 6 is a view in longitudinal section through middle of the longitudinal folder of FIG. 5, taken on line 6—6 of FIG. 5.

FIG. 7 is a view in vertical cross section thro the folder of FIG. 5, taken on the line 7—7 of that ure, showing the upper folding plate making the longitudinal fold.

FIG. 8 is a view similar to FIG. 7 on the line 8 of FIG. 5, showing the lower folding plate beginning second longitudinal fold.

FIG. 9 is a similar view taken on the line 9—9 FIG. 5, showing the second longitudinal fold comple

FIG. 10 is a top plan view of the front part of machine, taken on an elevation just below the fol plates on the line 10—10 of FIG. 1, showing some of drive mechanism and part of the main conveyor mechanism.

FIG. 11 is a vertical longitudinal section through transverse folding mechanism of the machine, taken the line 11—11 of FIG. 10.

FIG. 12 is a longitudinal elevation from the rea the machine as viewed in FIG. 1, showing part of stacking mechanism for the folded towels located at the elevator.

FIG. 13 is a view transversely across the mach taken on the line 13—13 of FIG. 12 and showing mechanism of that figure, the angle irons of the stacl mechanism being shown in their normal or "up" posit

FIG. 14 is a longitudinal section through the mi of the machine from rear to front, reading from lef right, taken on the line 14—14 of FIG. 13.

FIG. 15 is a vertical view, partly in section, ta across the stacking mechanism of FIG. 14 on the 15—15 of that figure, showing the angle irons in t stacking positions.

FIG. 16 is a view in side elevation from the right

e machine, showing the elevator in an "up" or stack-osition.

G. 17 is a view in vertical section through the elevator G. 16, taken on the line **17—17** of that figure.

G. 18 is a diagram of a portion of the compressed stribution system of the machine.

G. 19 is a plan view of the timing mechanism C ıe transverse folder, certain parts being removed for y.

G. 20 is a sectional view in elevation of the timing anism of FIG. 19, viewed from the right of that on the line **20—20**.

G. 21 is a view in elevation from the right of FIG. howing the timer cams for the transverse folder ı and other switches.

G. 22 is a diagrammatic plan view of the complete g mechanism of the machine.

GS. 23*a*, 23*b* and 23*c* are a schematic diagram of lectrical circuit of the machine. FIG. 23*a* shows ircuit for the transverse folder and also shows the t for miscellaneous control devices.

G. 23*b* shows the circuit of the counter for deter-g the number of articles stacked.

G. 23*c* shows the circuits of the stacking mecha-the elevator and the pusher for removing stacked s from the machine.

G. 24 is a transverse section of the stacking mech-, showing a modification thereof.

G. 25 is a fragmentary section on the line **25—25** G. 24.

on reference to the drawings in detail, it will be that the machine is generally shown in its entirety G. 1. In this and other views, articles of linen or ke are designated by the reference letter T. In ıl, except as specifically indicated below, the draw-ıre substantially to scale of a working model of achine, and reference is made to the drawings to ete the disclosure. For convenience, the articles en T will be referred to as towels, although it will parent that other articles of linen may be folded s machine. I will first describe the manipulation towels generally.

. 1 shows a portion of an input conveyor A sup-by machine frame **1** at the front or input end of achine. Said input conveyor A is shown in detail GS. 2–4. Towel T enters the machine at the upper hereof, where it travels along the bottom face of conveyor belt **10** through longitudinal folder B. ongitudinal folder B is shown in detail in FIGS. Longitudinal folder B folds towels T longitudinally verlapping thirds.

the rear of the machine, change-of-direction roller nounted on frame **1** with its axis extending laterally. yor belt **10** passes over, in front of and below e-of-direction roller **11** and is spaced therefrom. e-of-direction roller **11** is positioned to intercept T as it leaves longitudinal folder B and is adapted erse the direction of movement of towel T. Con-belt **10** again receives towel T as it leaves change-ction roller **11** and is adapted to carry towel T dly upon its upper face on a level below that of ıdinal folder B in the direction of the front of the ne.

its forward movement the towel T passes oper-between belt **10** and an ironer **12** which is sup-by frame **1** in normal operative engagement with). A spring-controlled arm or rod **13** located just d of the ironer **12** is adapted to move belt **10** out erative engagement with ironer **12** when belt **10** noving, a solenoid IS holding rod **13** clear of belt ile the latter is moving.

wardly of ironer **12** and after passing rod **13**, towel atively engages a timer switch lever **14**, which con-he operation of timer mechanism C, said timer

mechanism being shown in detail in FIGS. 19–22 and being mounted at the bottom front of frame **1**.

Forwardly of timer switch **14**, conveyor belt **10** passes over, in front and under idler roller **15** and then travels rearwardly. As towel T passes over roller **15**, it is folded across its width and pushed rearwardly by transverse folder lever **16** of transverse folder mechanism D. Timer mechanism C controls the operation of folder lever **16** so that it folds towel T centrally across its length. This transverse folder mechanism is shown in detail in FIGS. 10 and 11.

The now completely folded towel T is carried rearwardly against the bottom face of main conveyor belt **10** until it enters stacking mechanism E. Conveyor belt **10**, which is continuous, then follows a return path, in which it is idle, to the point where it receives towel T from input conveyor A. Stacking mechanism E is suitably actuated, when towel T is fully received therein, to drop towel T upon stack **17**. Stacking mechanism E is shown in detail in FIGS. 12–15.

The towel stack **17** is supported by an elevator F which extends above the bottom of frame **1** and which gradually drops downwardly as it receives towels T. When stack **17** contains a pre-determined number of towels, means are provided for rapidly dropping elevator F to its lowest position, shown in FIG. 1, and for driving a pusher **18** rearwardly to force stack **17** off elevator F and on to an outlet platform **19** mounted on the rear of frame **1**. Elevator F is shown in detail in FIGS. 16 and 17.

Main conveyor belt

The disposition of main conveyor belt **10** and the drive means therefor are clearly shown in FIGS. 1, 10 and 11. The direction of movement of belt **10** is shown by arrow **2** (FIG. 1).

Lateral idler roller **20**, which is mounted upon frame **1** at the top front thereof, will be taken for convenience as the starting and return point of the continuous belt **10**. A further lateral idler roller **21** is mounted upon frame **1** near the top rear thereof. There is a lateral idler roller **22** fixed on a laterally extending horizontal shaft **461** rotatably mounted upon frame **1** behind and on a level with roller **21**. Lateral idler roller **23** is mounted upon frame **1** somewhat below roller **22**. Belt **10** passes in front of and under roller **20**, under roller **21**, over and behind roller **22** and behind and under roller **23**.

There is a lateral idler roller **24** mounted upon frame **1** at about the longitudinal center thereof and on about the level of roller **23**. Lateral idler roller **15** is mounted upon frame **1** near the front thereof and below roller **24**. Belt **10** passes over roller **24** and over, in front of and under roller **15**.

A pair of approximately horizontal arms **25** are mounted at their rear ends upon frame **1** generally below and laterally of roller **15** by means of lateral pivots **26** (see FIG. 11). Lateral shaft **27** connects arms **25** intermediate their ends. Roller **28** is mounted upon shaft **27** directly below roller **15**. Lateral rod **29** connects the front ends of arms **25**. Rods **30** extend upwardly from rod **29** through suitable openings (not shown) in frame **1**. Spring **31** on each rod **30** bears between frame **1** and stop nut **32** on the upper end of rod **30**, so that the front ends of arms **25** are urged upwardly. As a result, roller **28** is held under tension against the part of belt **10** passing under roller **15**.

Lateral shaft **33** is turnably mounted upon frame **1** nearer the rear of the machine and on an approximate level with roller **15**. Sprocket gear **34** is fixed to an end of shaft **33**, and roller **35** is fixedly mounted upon shaft **33**. Lateral roller **36** is mounted upon frame **1** forwardly of and slightly above the level of roller **35**.

A pair of arms **37** are mounted upon frame **1** by means of lateral pivots **38** and extend upward and forwardly therefrom (see FIGS. 1 and 11). Lateral idler roller

39 is connected between the upper ends of arms 37, and is located below the level of roller 24. Springs 40 are connected between an intermediate point of each arm 37 and a respective point on frame 1 located forwardly of arm 37, and the springs urge roller 39 forwardly.

Belt 10 extends under, behind and over roller 35, under roller 36 and in front of and over roller 39. Vertically spaced lateral idler rollers 41 and 42 are mounted upon frame 1 rearwardly of rollers 23 and 22. Belt 10 extends rearwardly from roller 39, under and behind roller 41, behind and over roller 42 and back over the starting roller 20.

As will become fully apparent below, towel T operatively engages belt 10 from starting roller 20 until belt 10 travels under roller 35, with the exception that towel T is out of engagement with belt 10 after it passes under roller 21 and while it passes over rollers 22 and 23. During the return path of belt 10, from roller 35 back to roller 20, it is out of engagement with towel T. Belt 10 is maintained under tension by the action of spring 40 upon roller 39.

Electric motor 43 located near the bottom of the frame 1 of the machine serves as the drive means for main conveyor belt 10. Motor 43 has a longitudinally rearwardly extending driven shaft 44 which drives a lateral driven shaft 45 mounted in reduction gear box 46. Sprocket gear 47 is mounted upon shaft 45. Endless drive chain 48 meshes with sprockets 47 and 34 and also meshes with a sprocket gear 49 fixed to a lateral shaft 50 mounted upon frame 1 rearwardly of sprocket 34. Chain 48 drives sprocket 34, together with shaft 33 and drive roller 35, as well as sprocket 49. Roller 35 drives belt 10.

Input conveyor

Input conveyor A is shown in detail in FIGS. 2–4. The drive means for input conveyor A is clearly shown in FIGS. 1 and 10.

Input conveyor A is supported by a pair of laterally spaced brackets 3 mounted upon the front of frame 1. Shaft 51 extends turnably between said brackets 3. A pair of input conveyor frame arms 52 are respectively turnably mounted on shaft 51 adjacent the respective brackets 3 and extend forwardly and downwardly therefrom. A pair of rollers 53 are fixed to shaft 51 intermediate arms 52. Rollers 53 are laterally spaced from each other.

Sprocket wheel 54, which is the drive sprocket for conveyor A, is fixed to shaft 51 between rollers 53.

There is a sprocket wheel 55 fixed to the opposite end of shaft 33 from sprocket 34 (see FIGS. 10 and 11). A lateral shaft 56 is turnably mounted at its ends upon blocks 144 which are respectively fixed to frames 1 near the front thereof and below sprocket 54. Sprocket wheel 57 is mounted on an end of shaft 56 in line with sprocket 55. Shaft 58 is turnably mounted upon frame 1 in front of shaft 56 and carries sprocket 59. Endless drive chain 60 extends meshingly behind and under sprocket 55, over sprocket 57, under, in front of and over sprocket 59, and over sprocket 55 and hence back to its starting point.

Sprocket wheel 61 is fixed to the central portion of shaft 56. Endless chain 62 meshes with sprocket 61 and sprocket 54 in the usual manner to drive the input conveyor.

From the foregoing, it will be apparent that motor 43 drives shaft 51 in a clockwise direction, as viewed in FIG. 3.

The front ends of arms 52 are connected to a cross-iron 63 which extends laterally outwardly beyond both arms 52. Frame arms 64 are connected to the respective ends of iron 63 and extend both forwardly and rearwardly thereof in substantially the same direction as arms 52.

One end of air cylinder 65 is connected to frame 1 by lateral pivot 66. Cylinder 65 extends upwardly and forwardly from pivot 66. Plunger 67 extends out of the upper end of cylinder 65 and is pivotally connected to lateral shaft 68, which extends between arms 64 wardly of iron 63.

As will be further described below, compressed is supplied to the interior of cylinder 65 to urge plur 67 and hence the front end of conveyor A upwardly.

Arms 64 have upwardly extending ears at the hig end thereof, between which lateral shaft 69 exte Four rollers 70 are mounted upon shaft 69. Arms also have downwardly extending ears at the higher thereof, between which lateral shaft 71 extends. A of rollers 72 are mounted upon shaft 71 adjacent the spective arms 64.

Lateral shaft 73 extends turnably between the fr ends of arms 64 and also extends outwardly from th Four rollers 74 are fixed to shaft 73 between arms 6 work with the rollers 70 at the upper ends of the arms as hereinafter described.

Arms 64 have depending portions near their lo ends, between which shaft 75 extends. Four individ bell crank levers 76 are turnably mounted at intermed points thereof upon shaft 75. One end of each lever extends forwardly of shaft 75 and has a lateral roller turnably mounted thereon. The other end of each le 76 is connected by spring 78 to a lateral rod 97 extend between arms 64, so as to urge roller 77 downwardly.

A pair of center belts 79 are provided. Each belt extends around a roller 53 and a center roller 74 also extends over a center roller 70 and under a spri pressed roller 77. Belts 79 are driven by chain 62 an turn drive rollers 74.

A pair of side belts 80 are provided. Each belt 80 tends around a side roller 70, a roller 72, a spring-pres roller 77 and a side roller 74. Belts 80 are driven rollers 74 through the belts 79 and shaft 73.

Belts 79 and 80 move in the direction of arrow 81 (F 3). Each of these belts is individually tensioned by associated roller 77. Conveyor A is wider than fram except at its upper portion, where belts 79 extend ab belts 80.

A pair of arms 82 are positioned outside the respect arms 64 and are connected to the lower part of these a by lateral pivots 83. Said arms 82 extend forwardly pivots 83. A relatively heavy idler roller 84 is connec between arms 82 and rests against the front faces of b 79 and 80 above rollers 74.

Input conveyor A is adapted to be placed in posit relative to a conveyor belt 85 (FIG. 3) to receive tow T carried by said belt 85. As an example, belt 85 n be the output conveyor belt of an ironer. Belt 85 shown as moving in the direction of arrow 88 aroun roller 86 mounted upon a lateral shaft 87. Said shaft is fixed to the ironer frame (not shown). In order position conveyor A properly relative to ironer belt conveyor A is provided with a pair of arms 89 turna mounted on the respective ends of shaft 73 outside a 64. Each arm 89 extends forwardly and downwardly shaft 73. The rear end portion of arm 89 has an arcu slot 90 through which screw 91 extends. Screw 91 tends into a suitably threaded hole (not shown) in a 64 and may be tightened to lock arm 89 in a selec turned position on shaft 73.

The front ends of arms 89 are joined by a lateral sh 92 upon which idler roller 93 is mounted. Shaft 92 a extends outwardly of arms 89 and has pulleys 94 moun on its outer ends. Pulleys 95 are mounted on the resp tive outer ends of shaft 73. Idler pulley belts 96 ext around the respective pairs of pulleys 94 and 95.

In the use of the machine, frame 1 is rolled upon cast 9 until idler belts 96 abut ironer conveyor belt 85 un roller 86, as clearly shown in FIG. 3. The air pressure cylinder 65 upon plunger 67 holds conveyor A in p tion against belt 85. The length of belts 96 permits pl ing conveyor A in position against roller 86 located varying heights above the floor. Preferably, roller also abuts belt 85, but the provision of belts 96 extends

e of contact when it is impractical for roller **93** to belt **85**.

hen conveyor A is thus positioned relative to belt **85** roller **86**, the leading end of a towel T carried on the r face of belt **85** strikes the front faces of belts **79** 80 and is carried thereby under roller **84** before the ng end of towel T leaves belt **85**. Preferably, towel es not exceed in width the distance between the re- ive outer side edges of belts **80**.

towel T moves past the belts **80**, the side portions wel T drop down outside the respective side arms **52**.

Longitudinal folder

ngitudinal folder B is shown in detail in FIGS. 5–9. use the plates thereof are very thin, being approx- ly one eighth of an inch thick, the thickness and ng of the plates has been exaggerated in these views. ngitudinal folder B includes a ferromagnetic main **100** which is positioned just below main conveyor **10** and which extends from a point just behind roller a point just in front of the point at which belt **10** s between rollers **11** and **21**. Near its front end, plate **100** is supported from below by a laterally ex- ng frame portion **8**. The remainder of plate **100** is orted in a manner to be described below. The front of plate **100** is positioned just behind the rear ends of **79**.

ate **100** has a central front-end extension **101** which s over sprocket **54** and is curved downwardly in front rocket **54** (see FIGS. 2, 3 and 4). Plate extension s located between belts **79**. Plate extension **101** pre- towels T from striking sprocket **54**. Also, plate sion **101** carries a switch AE whose switch lever **102** ds upwardly between belts **79** in a position to be ssed by a towel T carried by belts **79**, whereby to switch AE. As will become fully apparent below, losing of switch AE by a towel actuates a timer which the operation of the machine if the towel does not ge from the stacker within a specified time interval. n leaving input conveyor belts **79**, towel T travels en the lower face of main conveyor belt **10** and the r face of main folder plate **100**, as clearly shown IG. 3. Preferably, the front end portion of plate s of approximately the same width as the rear part nveyor A, plate **100** being of somewhat reduced n rearwardly thereof (FIG. 5). A plurality of tudinally spaced weights **103** rest upon the upper of belt **10** rearwardly of roller **20**, so that belt **10** onally engages towel T. Each weight **103** has a **104** extending downwardly from its upper face and ding the width thereof. A lateral rod **105** is fixedly orted by frame **1** and rides in said slot **104**. Said its **103** are located forwardly and rearwardly of e portion **8**.

arwardly of weights **103**, and below the uppermost n portion of belt **10**, frame **1** has a longitudinally ex- ng frame portion **7** (see FIGS. 6 to 9). A plurality uds **106** depend from frame portion **7** and support gitudinally extending, non-magnetic plate **107** spaced said frame portion **7**. Preferably, studs **106** are lly disposed beyond the respective side edges of plate **100**, and are evenly spaced on both sides of **107** along the entire length thereof. Plate **107** ds almost as far rearwardly as main plate **100** (see 1).

plurality of spaced magnets **108** are supported be- n frame portion **7** and the upper face of plate **107**. rably, magnets **108** are disposed in two longitudinal- tending rows located inwardly of the respective side s of plate **107** (see FIG. 5).

ch magnet **108** is horseshoe-shaped, with its pole s extending downwardly from its cross-piece and tudinally alined, and with its cross-piece fixed to e portion **7** by bolt **450**, or optionally by a strap.

ate **100** is preferably only one-sixteenth of an inch thick and is flexible and resilient. Magnets **108** support that portion of plate **100** (most of the lengths thereof) which is not supported by frame portion **8** and hold plate **100** evenly in frictional abutment with the lower face of belt **10**, so as to hold belt **10** in operative engagement with towel T.

Upper and lower non-magnetic, longitudinally extending folding plates **109** and **110** are provided. The front of upper folding plate **109** is preferably located forward of the front of plate **107**. The left side of plate **109**, as viewed in FIGS. 7–9, extends laterally outwardly of main plate **100** and is supported by angle iron **451**. The right side of plate **110**, as viewed in FIGS. 7–9, is similarly supported by another angle iron **451**. Both angle irons are similarly mounted on the frame, that of plate **110** being shown in detail in FIGS. 5*a* and 5*b*.

Angle iron **451** extends longitudinally and has a horizontal arm fixed to plate **110** and a vertical arm **452** adjustably supported by frame **1**. In order to support arm **452**, a plurality of vertical channel irons are fixed to frame **1**. Each said channel iron has a longitudinal cross-arm **453** and laterally inwardly extending end arms **454**. Said channel iron is located outwardly of angle iron **451**. Block **455** is positioned between arms **454** and is vertically adjustably secured to each arm **454** by means of respective screws **456** which extend through respective vertically elongated solts **457** in arm **454** and into respective thread holes (not shown) in the side of block **455**.

Angle iron arm **452** is attached to each block **455** by means of a respective screw **458** which extends through arm **452** and into a threaded hole in block **455**, the head screw **458** abutting the inner wall of arm **452**. Additional screws **459** extend through slot **460**, in channel iron arm **453** and through respective threaded holes in block **455**. Screws **459** are respectively located above and below screw **458**, and the inner ends of screws **459** abut iron arm **452**. It will be apparent that by adjustment of screws **459**, plate **110** may be rocked to a selected inclination relative to the horizontal. The vertical position of pate **110** may be adjusted by means of screw **456**.

The front portion **111** of the right edge of plate **109**, as taken in FIGS. 7–9, meets the left edge thereof at the extreme front of plate **109** and diverges rearwardly therefrom. The rear portion **112** of the right edge of plate **109** is parallel to and preferably located in vertical alignment with the right edge of main plate **100**.

The front of lower folding plate **110** is located rearwardly of the front of plate **109** and preferably slightly forward of a plate edge portion **112**. The right side of plate **110**, as viewed in FIGS. 7–9, extends laterally outward bound main plate **100** and is fixed to a second angle iron **451**, which is supported entirely similarly to the first angle iron **451**.

The front portion **113** of the left edge of lower folding plate **110**, as taken in FIGS. 7–9, meets the right edge thereof at the extreme front of plate **110** and diverges rearwardly therefrom. The rear portion **114** of the left edge of plate **110** is parallel to and preferably located in vertical alignment with the left edge of main plate **100** (see FIG. 9).

Plates **109** and **110** extends rearwardly to approximately the same point as plate **100**.

In operation, when towel T first enters folder B, it has a central portion resting upon main plate **100** and respective side portions extending below the side edges of plate **100**. One of these side portions of towel T strikes the portion of upper folder plate edge portion **111** protruding laterally beyond plate **100** and rides along said edge portion **111** so that it is forced between plate **100** and plate **109**. The second and third positions of the towel portions in FIG. 5, as well as FIGS. 7 and 8, clearly show this step. As shown in FIGS. 8 and 9, the leading edge **113** of the lower folding plate **110** makes the second

longitudinal fold of the towel under the upper folding plate **109**.

The width of plate **100** relative to standard towel width is optionally chosen so that towel T is folded approximately into thirds. However, in view of the further folding of towel T, to be described in detail below, it does not matter if the center portion of towel T is wider than the two side portions folded under said center portion. In fact, the center portion of towel T is usually wider than said folded side portions.

Change-of-direction roller

Change-of-direction roller **11** is clearly shown in FIG. 1. Roller **11** is fixedly supported by a lateral shaft **120** turnably mounted upon frame **1**. Pulley **462**, which is fixed to shaft **461**, and pulley **463**, which is fixed to shaft **120**, are coupled by pulley belt **464** so as to drive roller **11**. Preferably, the linear circumferential speed of roller **11** exceeds the linear speed of belt **10**.

A curved transversely and laterally extending plate **121** is supported by frame **1** behind roller **11** and in front of rollers **22** and **23**. The front face of plate **121** is concave in vertical longitudinal section and is sufficiently spaced from the periphery of roller **11** to accommodate the partly folded towel T.

As the leading end of towel T leaves folder B at the rear end thereof, it falls upon the periphery of roller **11**. The trailing portion of towel T continues to be pushed rearwardly between belt **10** and plate **100**, so that towel T drops between roller **11** and plate **121**. The movement of towel T between roller **11** and plate **121** is also aided by gravity, by the driven turning of roller **11**, and by the frictional engagement of towel T between roller **11** and plate **121**. Towel T is carried forwardly upon belt **10** after leaving roller **11**.

Ironer

Ironer **12** is clearly shown in FIG. 1.

Ironer **12** is supported by plate **122** which extends laterally and longitudinally beyond it and which is supported by frame **1** in a suitable manner (not shown). Belt **10** is normally supported by rollers **23** and **24** so as to abut the lower face of plate **122** frictionally. The rear end portion **123** of plate **122** is curved upwardly away from belt **10**.

A front casing **124** containing heater elements and a rear casing **125** containing a thermostat are mounted on top of plate **122**. As will be explained in detail below, the thermostat and the heater elements are adapted to be connected in a suitable electric circuit in order to heat plate **122** to a selected temperature. Towel T passes under plate portion **123** and then moves frictionally between plate **122** and belt **10**, so that the heated plate creases the longitudinal folds in towel T. This is often necessary to prevent unfolding of towel T when the folded side portions are very narrow.

A generally upstanding bracket **126** is mounted on top of casing **124** at the front thereof. Ironer solenoid IS is mounted upon the front face of bracket **126** and is spaced above belt **10**. Solenoid IS has a transverse plunger **127** extending therethrough and coupled at its upper end, above solenoid IS, to bracket **126** by means of compression spring **128**. The lower tip of plunger **127**, below solenoid IS, carries cross-rod **13**. Said cross-rod **13** is normally urged towards belt **10** by spring **128**. However, when belt **10** is moving, solenoid IS is energized by means to be described in detail below, and holds rod **13** spaced above belt **10**.

When belt **10** stops for any reason, solenoid IS is de-energized, and plunger **127** is forced downwardly by the action of spring **128**. As a result, rod **13** engages belt **10** and moves it to its broken-line position of FIG. 1, in which it is spaced from plate **122**. This prevents the residual heat of plate **122** from burning belt **10**.

Towel length switch

Towel length switch X is shown in detail in FIGS. and 11.

Towel length switch X is supported by means of l eral plate **130**. Plate **130** is supported by frame **1** bears frictionally against the lower face of belt **10** f wardly of roller **24**. Bracket **131** is attached to plate **1** beyond one side edge of belt **10** and extends above t **10**. The casing of switch X is mounted on the inner f of bracket **131** and extends over belt **10** and is spa therefrom. Said casing carries an inwardly extendi turnable shaft **132** to which one end of actuating lever is fixed. Lever **14** is made of spring wire and exte downwardly and forwardly from shaft **132**. Lever has a curved free end portion **133**.

Lever end portion **133** normally rests lightly upon t **10**, in which position switch X is open. While the len of towel T is passing between belt **10** and lever end p tion **133**, thereby raising the end portion, switch X mains closed with corresponding actuation of timer me anism C to be explained in detail below.

In order to ensure positive movement of switch le **14** from its closing position to its open position, obstr tion member **134** is connected to plate **130** at the sa side of belt **10** as bracket **131**. Obstruction member **1** extends upwardly past the side edge of belt **10** and p trudes inwardly thereof and has a longitudinal slot 4 Normally, lever end portion **133** extends through slot 4 against belt **10**. Obstruction member **134** has a lov rear lateral knife edge **135** which is forwardly inclin from the outer edge of member **134**. The rear face member **134** is forwardly inclined from edge **135**, wh frictionally abuts belt **10**.

A side portion of the front edge of the moving tov T strikes edge **135** and it rides over obstruction **134**. a result, the side portion of towel T passes under swit lever **14** and raises its end portion **133** out of slot 4 thereby causing a greater movement of lever **14** than t flattened partly folded towel T could cause. Switch is closed when lever **14** is thus raised.

Transverse folder

Tranverse folder D is shown in detail in FIGS. 10 a 11.

Folder D includes a lateral shaft **140** turnably mount upon frame **1** above roller **15**. Lever arms **16** are spectively fixedly mounted upon shaft **140** and exte forwardly therefrom. Arms **16** are respectively in appr imate longitudinal alinement with the side edges of b **10** as it passes over roller **15**.

Folder blade **141** is connected to the lower ends arms **16** and extends between the two arms **16** and a rearwardly thereof. A further lever **142** is fixed to sh **140** intermediate arms **16** and extends upwardly fr shaft **140**. Lever **142** is located forward of frame p tion **8** and is connected thereto by spring **143**. Tensi spring **143** urges lever **142** in a clockwise direction ab the axis of shaft **140**, as viewed in FIG. 11, and there normally maintains blade **141** in its front, inactive po tion.

Blocks **144** are fixed to frame **1** outwardly from t respective arms **16**. Each block **144** carries on its r face a spring blade **145** which extends below block 1 Blade **141** has lateral projections with respective upstar ing flanges **146** which bear rubber stops **147** on the resp tive front faces thereof. These stops **147** are respectiv adapted to strike the respective rear faces of the lo end portions of blades **145**, whereby the forward mo ment of blade **141** under the urging of spring **143**, checked.

Folder solenoid FS is mounted upon frame **1** forwar of lever **142**. Solenoid plunger **148** extends rearward c of the casing of solenoid FS and carries on its rear end yoke **149**. The upper end of the lever **142** extends betwe

arms of yoke 149 and is attached thereto by lateral
)t 150.
he action of solenoid FS is controlled by timer mecha-
1 C, in a manner to be described in detail below. When
noid FS is energized, plunger 148 is drawn forwardly,
nst the action of spring 143, and blade 141 is moved
wardly to its broken-line position of FIG. 11, in which
substantially horizontal and its rear edge approaches
opening between rollers 15 and 28.
older limit switch FL is mounted upon frame 1 below
1ger 148 and in front of lever 142. Laterally extending
er limit switch lever 151 is attached to the rear of the
ng of switch FL by transverse pivot 152. When lever
is drawn rearwardly by plunger 148, lever 142 strikes
r 151 and opens the normally closed switch FL. As
be fully explained below, this results in the immediate
rruption of the circuit of solenoid FS, so that spring
returns blade 141 to its normal position. The move-
it of folder blade 141 between its two positions is ex-
1ely rapid.
ongitudinally extending, metal plate 153 is centrally
)orted by frame portion 469 rearwardly of rollers 15
28. Plate 153 extends rearwardly just below and
roller 35 and also past sprocket 49. Belt 10 friction-
engages the upper face of plate 153. Plate 153 has a
nwardly inclined front extension 154 which is posi-
ed proximate to the opening between rollers 15 and 28.
e 153 is downwardly bowed in longitudinal section and
) formed that its ends are upwardly springable. As
sult, plate 153 exerts uniform tension on belt 10 along
ength.
lade 141 is timed to move rearwardly to strike the cen-
lateral line of towel T after it has passed switch X.
le 141 folds towel T on that line, and the two result-
towel portions on either side of the fold line are
1ed by blade 141 between belt 10 and roller 28.
ng 31 urges roller 28 upwardly to catch towel T fric-
ally between roller 28 and the portion of belt 10 carried
:r roller 15. As a result, belt 10 carries the folded
:l rearwardly over plate extension 154 and hence be-
:n belt 10 and plate 153. Towel T is carried rear-
lly between belt 10 and plate 153 toward stacking
hanism E.
he lower face of blade 141 is substantially horizontal
1e instant towel T is folded. The upper face 466 of
e 141 is then upwardly forwardly inclined. As a
lt, towel T is frictionally engaged between blade face
and belt 10 before it is frictionally engaged between
10 and roller 28. This makes it possible to limit rear-
d movement of blade 141 (by means of the usual limit
within solenoid FS for rod 148) slightly forwardly
he point to which blade 141 would otherwise have to
'e, thereby mininizing the danger of blade 141 becom-
jammed between the rollers. Also, the thick wedge-
)e of blade 141 helps to prevent disturbance of the fold
:ed by movement of the upper folded portion relative
he lower folded portion resulting from contact of
upper folded portion with belt 10. Roller 28 is prefer-
covered with rubber for greater frictional engagement
the lower folded portion of towel T to aid in even
'ement thereof.

Stacking mechanism

:acking mechanism E is shown in detail in FIGS. 12–
It will be noted that FIG. 12 shows the opposite side
1e machine from the side shown in FIG. 1.
:acking mechanism E includes a conveyor belt sys-
which frictionally engages the upper surface of a
:l T and draws it onto a pair of stacker members or
; having smooth operating faces, here shown as angle
s 178, until the towel T lies above the desired stack
tion. Then the stacker members are moved from
r normal support position to a retracted position in
:h the towel T is free to drop.
he stacker conveyor system includes the previously mentioned lateral shaft 50 whose sprocket 49 is driven by chain 48 (FIG. 1). It was previously stated that shaft 50 is supported by frame 1. The manner in which shaft 50 is supported will now be explained more fully.

Intermediate the ends of shaft 50, one or more levers 160 are fixed thereto. This lever 160 extends upwardly and forwardly from shaft 50 and is connected at its upper end by lateral pivot 161 to block 162. Block 162 abuts the lower face of a cross-arm 163 of frame 1 and has an upstanding flange 164 located in front of arm 163. Adjusting screw 165 extends through flange 164 and into arm 163 and helps to hold block 162 to arm 163. The setting of screw 165 may be varied to adjust the longitudinal position of shaft 50.

Intermediate its ends, lever 160 is connected by adjusting screw 166 and block 167 to the lower face of arm 163, to permit vertical adjustment of shaft 50.

A pair of laterally spaced pulleys 168 are fixed to shaft 50.

A further lateral shaft 169 is located rearwardly of shaft 50 and carries two further pulleys 168 in respective longitudinal alinement with the front pulleys 168. One or more further levers 160 are fixed to shaft 169 and extend upwardly and rearwardly therefrom and are optionally adjustably attached to frame 1 similarly to the first-mentioned lever 160.

A pair of pulley V-belts 170 extend around the respective longitudinal pairs of pulleys 168 and serve as conveyor belts for towel T. Plate 153 extends rearwardly under and past the front pulleys 168, so that the leading edge of towel T moving between plate 153 and main conveyor belt 10 and passing out of engagement with belt 10 passes into the space between belts 170 and plate 153 before the trailing edge of towel T passes belt 10 (see FIGS. 1 and 14).

The angle irons 178 of stacking mechanism E are supported by means of two sets of columns 171 which depend from frame 1 laterally outwardly of pulley belts 170 and which extend below said belts 170. Said columns 171 are also located longitudinally between the front and rear pulleys 168, and the columns of each set are longitudinally alined.

The bottom portions of the columns 171 of each set are formed to provide suitable bearings through which a longitudinal shaft 172 extends turnably. A pair of end arms 173 and a pair of intermediate arms 174 are mounted upon shaft 172.

At their other ends, the arms 173 and 174 associated with each shaft 172 are fixed to the outer face, as viewed in FIG. 13, of the transversely and longitudinally extending arm 176 of one of the angle irons 178 of stacking mechanism E. In the normal position of FIGS. 12–14, the other arm 177 of angle iron 178 is integral with the upper edge of arm 176 and extends horizontally inwardly thereof.

In order to regulate the turned positions of angle irons 178, the angle iron arms 176 are coupled to the plunger 179 of an air cylinder 180. Said air cylinder 180 is fixed to frame 1 laterally outwardly from one of the angle irons 178 and at the front part of stacking mechanism E. Plunger 179 extends out of the rear end of cylinder 180. Links 181 are secured to the rear end of plunger 179 by lateral pivot 181*a*. One end of arm 182 is positioned between the links 181 and connected thereto by lateral pivot 183. Arm 182 extends upwardly from links 181.

Lateral shaft 184 is turnably mounted upon frame 1 and extends above and laterally outwardly from angle irons 178. The upper end of arm 182 is divided to provide fork arms 185 between which an outer end of shaft 184 is located. Arms 185 are held together above shaft 184 by means 186 in order to fix arm 182 to shaft 184.

Brackets 187 are respectively fixed to the outer faces of the respective angle iron arms 176 between the arms 174 respectively associated therewith. Links 222 are con-

nected to respective faces of brackets **187** by longitudinal pivots **223**. The lower end of coupling link **188** is connected between respective links **222** by means of longitudinal pivot **189**. The upper end of link **188** is connected between the lower ends of a pair of link plates **190** by means of lateral pivot **191**. Lever arm **192** is connected at one end thereof between the upper ends of the link plates **190** by means of pivot **193**. The other end of lever arm **192** is fixed to shaft **184**.

Plunger **179** is shown in its normal position in FIG. 12. When air is admitted to cylinder **180**, plunger **179** is pushed rearwardly in the direction of arrow **194**. As a result, shaft **184** is turned in a clockwise direction, as viewed in FIG. 12, link plates **190** are raised, and angle irons **178** are turned from their positions of FIG. 13 to their positions of FIG. 15. In FIG. 13, angle iron arms **177** extend horizontally and are positioned below the respective pulley belts **170**. In FIG. 15, said arms **177** extend vertically and are positioned laterally outwardly from pulley belts **170**.

There is a horizontal pusher plate **195** normally positioned between pulley belts **170** and above angle iron arms **177**. It is coupled to angle iron arms **176** for downward movement when angle irons **178** move to their stacking positions of FIG. 15. Plate **195** is substantially co-extensive longitudinally with angle irons **178**.

Plate **195** is supported at the central portion of its upper face by a thin block **196**. The upper face of block **196** carries a pair of longitudinally spaced and alined posts **197**. These posts **197** are supported, by means of adjusting nuts **198**, by a longitudinally extending arm **200** which is spaced above block **196** and which extends longitudinally beyond the posts **197**. Legs **199** depend from arm **200** at the ends thereof. The front leg **199** is laterally alined with and coupled to the respective front arms **174**. The rear leg **199** is laterally alined with and coupled to the respective rear arms **174**.

In order to couple each leg **199** to its associated arms **174**, each arm **174** has a split portion within which the lower end of link **201** (as viewed in FIGS. 12–14) is connected by means of longitudinal pivot **202**. The upper end of link **201** is connected within a forked end portion of lever **203** by means of longitudinal pivot **204**. Lever **203** extends upwardly and inwardly from pivot **204**. The central portions of the respective longitudinally associated levers **203** are connected to each other by longitudinal pivot shafts **205**, each shaft **205** extending through suitable holes in a pair of longitudinally alined columns **171**.

The upper ends of the laterally associated levers **203** respectively have respective upwardly extending links **206** and downwardly extending links **207** connected thereto by longitudinal pivots **208**. The lower ends of the links **207** respectively extend forward and rearward from their associated leg **199** and are connected thereto by longitudinal pivot **209**. Rod **210** is located slidably in an axial bore of leg **199** and extends above leg **199**. The upper ends of links **206** respectively extend forwardly and rearwardly of rod **210** and are connected thereto by longitudinal pivot **211**.

It will be apparent that when angle irons **178** are turned from their normal positions of FIG. 13 to their stacking positions of FIG. 15, arms **174** are turned ninety degrees about the axes of the respective shafts **172**. Levers **203** are thereby turned so as to force plate **195** to make a substantial downward thrust. In FIG. 15, plate **195** is positioned substantially below pulley belts **170**. During the movement of plate **195**, rod **210** slides within the bore of leg **199** to accommodate the changes in the distance between pivots **209** and **211**. It will be apparent that plate **195** is always horizontal and moves only vertically.

The positions and functions of stacker upper limit switch SUS, stacker down switch SD, stacker lower limit switch SLS and elevator down switch ED will now be briefly discussed. The electric circuits controlled by these switches will be fully described below (see FIGS. 12, 14 and 23*c*).

Switch SUS is supported by frame **1** and has a dep ing switch button **212** and a depending bracket to wl one end of switch lever **213** is connected by lateral p **214** (see FIGS. 12 and 14). The upper face of on the levers **192** carries a forwardly extending arm which is positioned and adapted to bear upwardly aga the free end of switch lever **213** and hold button **21** its upward position, closing switch SUS, while stacl mechanism E is in its normal or "up" position. As s as stacking mechanism E begins to move towards stacking position of FIG. 15, switch SUS is opened.

Switch SD is mounted upon frame **1** above plate and has a switch lever **216** secured thereto by lat pivot **217** (see FIG. 14). Lever **216** extends betw and below angle irons **178** and movably through a slot **467** of plate **195** (see FIG. 15), and its free end tion is in the path of movement of towel T. Switch is normally open. When a towel T strikes switch l **216** and moves it rearwardly, switch SD is closed. W both switches SUS and SD closed, air is instantly supp to cylinder **180** and stacking mechanism E is moved t stacking position, opening switch SUS. Towel T m downwardly and clears switch SD which also opens.

Because of the softness of towel T, it has been fo preferable in practice to make switch SD and its l **216** highly sensitive. As a result, it is possible that w stacking mechanism E is returning to its "up" posit lever **216** may vibrate to switch-closing position. H ever, with switch SUS still open, the stacking mechan cannot be prevented from returning to its "up" posit Switch SUS, therefore, acts as a relatively insensi safety switch for switch SD.

The stacker lower limit switch SLS is mounted up column **171** and has a depending switch button Switch SLS is a two-position switch. When stacl mechanism E moves to its stacking position of FIG. the outer end of one of the levers **203** (shown in bro lines in FIG. 13) strikes button **218** and moves sw SLS from its normal first position to its second posit Stacking mechanism E can only move downwardly w switch SLS is in its first position. When switch SL moved to its second position, the action of plunger **17** reversed, and the stacking mechanism returns to its mal position.

The elevator down switch ED is mounted upon upper face of plate **195** at the rear thereof and has an ternal lateral switch arm **220** (see FIGS. 14 and Switch lever **219** is made of spring wire and is coile one end thereof around arm **220** and fixed thereto. L **219** extends rearwardly from arm **220** and has a depen U-shaped bight which extends through and below **468** in plate **195**. Switch ED is normally open. W stacking mechanism E is in its position of FIG. 15, wh by switch SLS is in its second position, and when sw ED is closed (by means to be described in detail belo the operation of elevator F is affected.

In operation, towel T is carried along plate **153** u it rides upwardly on the downwardly inclined front g portions **221** of angle iron arms **177**. The side porti of towel T are then operatively engaged between the spective pulley belt **170** and arms **177** of angle irons Towel T moves rearwardly until it strikes switch l **216**. Arms **177** are then moved outwardly, and towe drops downwardly. Plate **195** is forced downwa more rapidly than towel T drops and forces towe downwardly upon the stack supported by elevator mec nism F. Upon actuation of switch SLS, the parts stacker mechanism E return to their original position

Optionally, pulley belts **170** are cog belts, as sh illustratively at **470**, the cogs **470** meshing with responding cogs (not shown) in pulleys **16B**, so as synchronize the drive of belts **170** with the drive of belt

evator mechanism F is shown in detail in FIGS. 16 17.

evator mechanism F includes a longitudinally extend- able **230** fixed to frame **1** below stacking mechanism id positioned to receive towels T released by said ing mechanism E. Optionally, longitudinally and rdly extending side plates **231** are fixed to the top ble **230** by means of angle irons **232**. Plates **231** ot shown in FIG. 16. Said table **230** has a thick- longitudinal center portion **233** which has a longi- al slot **234**. Table **230** also has pairs of longitudinal **235** respectively disposed between center portion and the respective side plates **231**.

rtical and longitudinal plates **236** extend slidably gh the respective slots **235**. As clearly shown in 16, each plate **236** is substantially rectangular and cut-out portions to reduce its weight. Plates **236** upported from below and by the sides of slots **235** to be substantially parallel and in lateral registra- and so as to have horizontal upper edges.

ates **236** are connected to each other by respective and rear lateral rods **237** and **238** and optionally ntermediate lateral rods **237***a*. Rods **237** and **238** djustably supported from below.

order to support rods **237** and **238**, a front longi- al compressed air cylinder **239** and a rear longi- al hydraulic cylinder **240** are fixed to frame **1** below tor plates **236**. Said cylinders **239** and **240** are tudinally alined with each other and transversely d with table center portion **233** and have a common er rod **241**. Rod **241** extends out of the rear of der **239** and out of the front of cylinder **240**.

pair of vertical and longitudinal plates **242** are ted upon frame **1** on opposite sides of rod **241** and tudinally forwardly of rod **238**. A second pair of **242** are similarly mounted upon frame **1** longi- ally forwardly of shaft **237**. Each plate **242** has a tudinal slot **243** extending between the respective side thereof.

d **241** is divided into sections which are joined by blocks **244**. Two such blocks **244** are provided, being located between a respective pair of plates

Each sleeve **244** has a lateral rod **245** extending through and extending outwardly through respective **243**. A roller **246** is frictionally and turnably lo- between the upper and lower edges of each slot **243** s turnably mounted upon a respective end of rod **245**. ds **245** extend laterally outwardly from their as- ted plates **242**. Linking arms **247** are respectively bly mounted at their lower ends upon the respective ends of said rods **245** and extend upwardly and ardly therefrom. The rear ends of the rear arms re turnably connected to the ends of rod **238**. The nds of the front arms **247** are turnably connected to nds of rod **237**. The distance between the front **245** and the rear rods **245** is equal to the distance en rods **237** and **238**.

rther linking arms **248** are respectively connected to espective arms **247** by means of lateral pivots **249**. **248** extend downwardly and rearwardly from their ctive pivots **249**. Frame **1** is provided with a lity of brackets **250** to which the lower ends of arms re respectively connected by means of lateral pivots

Each pivot **249** is equi-distant from its associated s **245**, **238** (or **237**) and **251**. All of the pivots **245** **251** are located in a common horizontal plane.

will be apparent from the above construction that rod **241** moves forward, elevator plates **236** are ed in unison, and that when rod **241** moves rear- , elevator plates **236** are raised in unison. FIG. 1 s plates **236** in their lowest position in which their edges are located just below the upper face of table although still retained within slots **235**. FIGS. 16 and 17 show plates **236** in a position intermediate their highest positions and their lowest positions. It will also be apparent that the upper edges of plates **236** are always horizontal, and that plates **236** move only vertically and not longitudinally.

There is a pusher plate **18** at the level of table **230** to remove the stack of towels from the elevator after the exact number of towels have been received. In order to support pusher plate **18**, a longitudinal air cylinder **252** is mounted upon the upper face of table **230** forwardly of elevator plates **236**. Plunger **253** extends out of the rear of cylinder **252**. The front end of plunger **253** supports a longitudinally and vertically extending plate **254**, to the rear of which the laterally and vertically extending plate **18** is secured. Plate **254** extends slidably through slot **234** and plate **18** is slidable along the top of table **230** between the center plates **236**. Rollers **255** are mounted on both side faces of plate **254** above and below table center portion **233**, by means of lateral pivots **256**. Rollers **255** frictionally and turnably engage the upper and lower faces of said table portion **233**.

When the top edges of plates **236** drop below the top face of table **230**, depositing a stack of towels T upon table **230**, and when plunger **253** is moved rearwardly, the stack is pushed rearwardly off table **230** and onto platform **19**, which is fixed to the rear of frame **1** on the same level as table **230** (see FIG. 1).

The positions and functions of elevator upper limit switch EU, elevator lower limit switch EL and pusher "out" limit switch POL, in conjunction with the previously described elevator down switch ED, will now be briefly discussed. The electric circuits controlled by these switches will be fully described below.

A collar **257** is mounted upon rod **241** intermediate the sleeves **244** and has a depending switch-actuating lug **258**.

Switch EL is mounted upon frame **1** forward of lug **258**. Switch lever **259** is mounted upon the rear face of switch EL for movement about a lateral axis and is in the path of forward movement of lug **258**. Switch EL is normally in a position in which it is possible for plunger rod **241** to be moved forward in order to lower plates **236**. When plates **236** are lowered below the top face of table **230**, lug **258** strikes lever **259** and moves switch EL to a second position permitting rearward movement of plate **18**.

Switch POL is mounted upon the lower face of table **230** rearwardly of plates **236**. Switch lever **261** is mounted on the front of switch POL for movement about a lateral axis. Switch POL is normally in a position permitting rearward movement of plate **18** when switch EL is momentarily placed in its second position. After plate **18** clears a stack of towels T from table **230**, the lower part of plate **254** strikes lever **261** and moves switch POL to its second position, causing a return of plate **18** to its normal forward position and permitting forward movement of rod **241** to raise elevator plates **236**.

Switch EU is mounted upon frame **1** rearwardly of lug **258**. Switch lever **260** is mounted upon the front face of switch EU for movement about a lateral axis and is in the path of rearward movement of lug **258**. Switch EU is normally in a closed position permitting rearward movement of rod **241** when switch POL is momentarily placed in its second position. Switch EU is opened when plates **236** are raised sufficiently so that lug **258** strikes lever **260**, thereby preventing further raising of plates **236**. Even when plates **236** are lowered from their highest positions, opening switch EU, the plates cannot be raised until switch POL is again moved momentarily to its second position.

In operation, with elevator plates **236** initially in their highest positions, towels dropped by stacking mechanism E are stacked upon the the upper edges of said plates **236**. Whenever the stack **17** becomes high enough so that the top towel thereon engages switch lever **219** as

the stacking plate 195 reaches its lower position, and moves lever 219 sufficiently to close switch ED, cylinder 240 is actuated to permit a slight forward movement of rod 241 and thereby drop plates 236 slightly. These downward drops of plates 236 will occur on the average every two or three times that a towel T is stacked. The action of plate 195, together with the proximity thereto of stack 17, ensures stacking the towels in a neat, even stack and permits rapid stacking operation.

As will be explained in detail below, after a pre-determined number of towels T have been stacked, plates 236 drop the remainder of the distance to their lowest positions. Pusher 18 is then actuated to transfer stack 17 to platform 19, after which pusher 18 returns to its normal position and plates 236 simultaneously rise to their highest positions.

Timing mechanism

Timing mechanism C is shown in detail in FIGS. 19–22.

Timing mechanism C is mounted upon a frame 270 which is supported by frame 1 forwardly of motor 43. The cover of timing mechanism C, shown in FIG. 1, is omitted in FIGS. 19–22.

Timer drive shaft 271 is turnably supported by frame 270 at the rear thereof. Shaft 271 extends longitudinally and has cog wheel 272 mounted on the rear end thereof. Motor 43 has a driven shaft 273 extending longitudinally forward therefrom and carrying cog wheel 274. Pulleys 272 and 274 are preferably coupled to each other by cog belt 275 (see FIGS. 1 and 19), so that motor 43 drives timing mechanism C in synchronism with main conveyor belt 10. The direction of rotation of shaft 271 is indicated by arrow 276.

Relatively short longitudinal shafts 277 are respectively turnably mounted upon frame 270 on opposite sides of shaft 271. Shaft 271 carries a gear 278 which meshes with gears 279 respectively mounted upon the rear ends of shafts 277, so as to drive the latter. The direction of turning of shafts 277 is indicated by arrows 280.

Relatively long longitudinal shafts 281 are respectively turnably mounted upon frame 270 outwardly of shafts 277 and carry on their rear ends gears 282 which mesh with respective gears 279. As a result, shafts 281 are turnable in the direction of arrows 283. Gears 284 are respectively mounted on the front ends of shafts 281.

Relatively short longitudinal shafts 285 are respectively turnably mounted upon frame 270 outwardly of shafts 281 and carry gears 286 at their respective front ends. Gears 286 mesh with respective gears 284, so that shafts 285 are turnable in the direction of arrows 287.

The mechanism associated with the shaft 285 on the right side, as viewed in FIG. 19 is clearly shown in FIGS. 19, 20 and 22 and will now be described in detail.

Shaft 288 is turnably mounted upon frame 270 rearwardly of and in axial alinement with shaft 285. Shaft 288 is axially spaced from shaft 285.

Sleeve or collar 290 is fixed to shaft 285 and extends turnably through a transverse portion 291 of frame 270. Clutch plate 292 is fixed to the rear of collar 290 and extends rearwardly thereof. Annular friction disk 293 is mounted upon the rear face of plate 292 (see FIG. 20).

An annular, transverse braking plate 294 is fixed to frame portion 291 and is located rearwardly of clutch plate 292. Annular friction disk 295 is mounted upon the front face of braking plate 294 and is in longitudinal registration with friction disk 293.

Sleeve 289 is axially slidably mounted upon shaft 288. Shaft 288 and sleeve 289 extend through the openings of plate 294 and disk 295. The front portion of sleeve 289 carries a transverse annular clutch plate 296. In its extreme forward position, shown in FIG. 20, clutch plate 296 frictionally abuts friction disk 293, so that sleeve 289 turns in unison with shaft 285. Optionally, shaft 288 protrudes slightly forwardly of plate 296 and is adapted to be positioned within the opening of disk 293 in the forward position of plate 296. In the extreme rearward position of sleeve 289, plate 296 frictionally abuts braking disk 293, preventing sleeve 289 from turning.

A further sleeve 297 is fixed to shaft 288 behind sleeve 289, and extends turnably through transverse frame portion 300. Sleeve 289 has a rear semi-cylindrical extension 298. Sleeve 297 has a front semi-cylindrical extension 299. The respective longitudinal faces of these sleeve extensions 298 and 299 are in sliding abutment, as clearly shown in FIG. 20. As a result, shaft 288 turns in unison with shaft 285 when clutch plate 296 abuts friction disk 293 and is motionless when plate 296 abuts disk 295.

A second frame portion 300 is located behind and spaced from the first mentioned frame portion 300. The upper ends of these frame portions 300 support platform 301. Timer solenoid BTS_1 is mounted upon the upper face of platform 301, with its plunger 302 protruding longitudinally forwardly thereof. Forwardly extending arm 303 is attached to plunger 302 by means of lateral pivot 304. The front end of arm 303 is coupled by spring 305 to a support 306 fixed to frame 270.

Laterally spaced supports 307 extend outwardly from the front end of the front frame member 300, at the top thereof. Lateral shaft 308 extends through these supports 307. A lever 309 is turnably mounted intermediate their ends upon shaft 308 and is positioned above a collar 310 mounted upon sleeve 289 rearwardly of plate 294. The upper end of said lever 309 is forked and is connected to the respective side faces of arm 303 by means of lateral pivot 311.

A vertically and laterally extending block 312 is fixed to the lower ends of lever 309. Block 312 extends laterally outwardly of lever 309 and carries depending, preferably integral fingers 313. These fingers 313 extend on both sides of collar 289 and abut both faces of collar 310.

It will be apparent from the above description that when solenoid BTS_1 is not energized, spring 305 maintains plate 296 in abutment with disk 295, so that shaft 288 cannot turn. When solenoid BTS_1 is energized plunger 302 moves rearwardly, against the action of spring 305, moving plate 296 into abutment with disk 293 so that shaft 288 turns.

It will be apparent without detailed description that shaft 277 is adapted to be clutch-coupled with shaft 314 (FIG. 19) in entirely the same manner as shaft 285 is adapted to be clutch-coupled with shaft 288, the action of the clutch for shafts 277 and 314 being controlled by timer solenoid BTS_2 (FIG. 22). Shafts 288 and 314 both turn in the direction of arrows 315 (FIG. 19).

Shaft 288 carries a worm gear 316 rearwardly of collar 297. Shaft 314 carries a corresponding worm gear 317 in lateral registration with and spaced from worm gear 316. (Worm gear 317 is not shown on the right side of timing mechanism C, as taken in FIG. 19; but the corresponding worm gear 317 on the left side is shown.) Worm gears 316 and 317, which are adapted to turn in the same direction and at the same speed control the action of a differential gear mechanism which will now be described.

A lateral shaft 318 is turnably mounted upon frame 270 and extends below and laterally outwardly of worms 316 and 317. Optionally, bearing sleeve 327 is mounted upon shaft 318. Spaced gears 319 and 320 are turnably mounted upon shaft 318, and respectively mesh with the respective worm gears 316 and 317. Said gears 319 and 320 respectively have gears 321 of smaller diameter fixed to their proximate faces and also turnable upon shaft 318.

A cylinder collar 322 is fixed to shaft 318 between gears 321, by means of screw 323. Collar 322 is of greater diameter than gears 321 and has openings in the respective ends thereof into which gears 321 respectively turnably extend.

Collar 322 has a recess 324 extending inwardly from

ts peripheral surface. Gears **325** of relatively small diameter are mounted upon the respective and faces of recess **324** by means of respective lateral pivots (not shown). Each gear **325** meshes with a respective gear **321**, and gears **325** also mesh with each other.

It will be apparent that when solenoids BTS_1 and BTS_2 are both de-energized, shaft **318** does not turn. When only solenoid BTS_1 is energized, so that worm **316** turns, shaft **318** turns in the direction of arrow **326** (FIG. 20) at a selected speed which is proportional to the linear speed of movement of belt **10**. When both solenoids BTS_1 and BTS_2 are energized, so that both worms **316** and **317** turn, shaft **318** turns in the direction of arrow **326** at twice the speed occurring when only solenoid BTS_1 is energized.

Timer cam **328** is fixedly mounted upon shaft **318** outwardly of gear **319** and is adapted to control the action of zero switch BZ, which is fixed to frame **270**. Timer cam **329** is mounted upon shaft **318** outwardly of cam **328** and is adapted to control the action of folder switch BF, which is fixed to frame **270**. The turned position of cam **329** on shaft **318** relative to that of cam **328** may be regulated by means of adjusting screw **330**. These parts are clearly shown in FIGS. 19 and 21.

The casing of switch BF is supported between the longitudinally extending arms of a generally U-shaped bracket **332**, the cross-arm **333** of which is located in front of and spaced from the front of folder switch BF. Arm **333** extends laterally and transversely. Bracket **332** is fixed to the outer longitudinal face of support plate **331**, which is in turn connected to the rear frame member **100** laterally outwardly thereof.

Lateral shaft **334** is connected between the side arms of bracket **332**. The upper ends of the side arms of a generally U-shaped lever **335** are turnably mounted upon shaft **334**, the cross-arm **336** of said lever **335** being positioned forwardly of shaft **334**. Intermediate its upper and lower ends, arm **336** carries a longitudinal button **339** which extends rearwardly thereof. Lever button **339** is positioned and adapted to engage switch button **340**, which protrudes out of the front of the casing of switch BF.

Lever arm **336** carries a nylon plate **337** on the front of its lower end portion, which plate **337** has a central nylon projection **338** on its front face. Projection **338** frictionally abuts and rides upon the periphery of cam **329**, switch button **340** being thereby normally pressed rearwardly to hold folder switch BF open.

Cam **329** has a cam notch **341** extending across the peripheral edge thereof. Preferably, the leading face of notch **341** extends substantially radially, and the trailing face thereof extends at an incline from the inner edge of the leading face to the peripheral face of the cam, as clearly shown in FIG. 21. When projection **328** is located in notch **341**, switch button **340** moves outwardly and switch BF closes.

It will be apparent without detailed description that zero switch BZ is coupled to cam **328** in substantially the same manner as switch BF is coupled to cam **329**, the shape of cam **328** being the same as that of cam **329**. The important difference is that zero switch BZ is closed at all times except when its associated lever projection **342** is located within the notch of cam **328**. It may also be noted that switch BZ is mounted upon the front frame portion **300** and faces in the opposite direction from switch BF. Projections **338** and **342** are disposed one hundred eighty degrees apart with respect to the rotation of the two cams.

It will also be apparent without detailed description that the left side of timing mechanism C, as taken in FIG. 19, is substantially the same in construction as the right side. In fact, each side of timing mechanism C constitutes a separate timer. The operation of the left timer is controlled by solenoids ATS_1 and ATS_2 and switches AF and AZ (FIG. 22).

In briefly describing the operation of timing mechanism C, it will be assumed for the sake of convenience that the left or "A" timer is the first to be placed in operation. Initially, cam **328** is in its zero position, with lever projection **342** located in the notch of said cam **328**, so that switch BZ is open. Initially, cam **329** is in a selected turned position relative to cam **328**, projection **342** being out of notch **341** and folder switch BF being open.

When the leading edge of towel T closes towel length switch X (FIG. 1), solenoid ATS_1 is energized, by means to be described in detail below, and cams **328** and **329** turn at half of their full speed. Switch AZ is now closed. Solenoid ATS_1 remains energized throughout the time that towel T is passing under switch X. When towel T leaves switch X, both solenoids ATS_1 and ATS_2 are energized, by means which are now independent of switch X and which will be described in detail below, so that cams **328** and **329** turn at their full speed. At this time, in general, notch **341** has not yet reached projection **338**. At this time, also, the "B" timer comes under the control of switch X, by means to be described in detail below, so that the movement of the next towel T is timed by the "B" timer.

The cams **328** and **329** of the "A" timer now turn at full speed until projection **338** enters notch **341**, whereby switch AF is closed. As will be explained in detail below, when switch AF is closed, folder solenoid FS is energized, whereby the transverse fold in towel T is made. Cams **328** and **329** continue to turn at full speed, projection **338** leaving notch **341** and re-opening switch AF, until cam **328** returns to its zero position, again closing switch AZ, whereby solenoids ATS_1 and ATS_2 are de-energized.

After the "B" timer has timed the folding of the next towel, the "A" timer again comes under the control of switch X, completing a cycle of operation of timing mechanism C.

In the preferred operation of timing mechanism C, the turned position of cam **329** relative to cam **328** is selected so that with cam **329** starting in its zero position, the time required for groove **341** of cam **328** to reach projection **338** so as to close switch AF with both cams turning at full speed, would be equal to the time required for the leading edge of towel T to be carried by belt **10** from the point at which switch X is first closed to the transverse folding point. Since cams **328** and **329** actually turn at only half of their full speed while the length of towel T is passing under switch X, it will be apparent that switch AF is not closed until half the length of towel T has passed beyond the transverse folding point. As a result, towel T is folded exactly at the center thereof. Since the longitudinal side folded portions of towel T face the folding levers, the finally folded towel is perfectly smooth and without protruding edges.

It will be apparent that towels T of varying length will each be transversely folded exactly at its center points. The turned position of cam **329** relative to that of cam **328** can be adjusted to compensate for fraction-of-a-second delays in solenoid operation and the like.

It will also be apparent that a second switch similar to towel length switch X, as well as a second transverse folding mechanism, can be provided. The two towel length switches can respectively actuate the respective timers "A" and "B," and the respective timers can respectively control the operation of the respective folding mechanisms. As a result, two transverse folds can be made in towel T.

The position of the transverse fold in towel T can be varied by varying the turned position of cam **329** relative to that of cam **328**.

An important result of the use of the two timers "A" and "B" is that towels T can follow each other in close succession upon belt **10**. This is because after a first towel leaves switch X, the further action of the timer controlling the folding of the towel is regulated by an

auxiliary relay, so that the other timer is immediately available to time the folding of a second towel. Preferably, the cams of the first timer return to their zero positions before the second towel leaves switch X.

Control devices

The description up to this point has concerned itself primarily with the mechanical operations performed by the various components of the machine. The control devices for the various components, which include electrical, mechanical, compressed air and hydraulic devices, will now be described in detail, with particular reference to FIGS. 18 and 23*a*, 23*b* and 23*c*.

Upon reference first to FIG. 23*a*, it will be apparent that the electrical circuit includes a pair of terminals **350** which are adapted to be connected to a source of alternating voltage, preferably 115 volts, 60 cycles. These terminals **350** are respectively connected through fuses **351** to respective lines **352** and **353**. Pilot lamp PL is connected between said lines **352** and **353**. Ironer heater element **354** and thermostat **355** are connected in series between lines **352** and **353**.

In the drawings, relay coils are generally designated by references letters without subscripts, and the switches or contacts operated by each relay coil are designated by the same reference letters as the relay coil, with the addition of numerical subscripts. All switches are shown in their normal positions.

In the drawings, a resistance **356** and capacitance **357** are shown connected in series across the terminals of many of the switches or relay contacts. These circuit elements will not be referred to in the detailed description of the electric circuit. Their purpose is to suppress sparking during the opening of the switch contacts.

Auxiliary timer relay switch TX_1 (in the normal position thereof), the normally open ON switch, motor starting relay MS, and overload switch OL_1 are connected in series between lines **352** and **353**. The normally closed OFF switch and motor starting relay switch MS_1 are connected in series across the ON switch. Motor starting relay switch MS_2, the motor circuit M of motor **43** and overload device OL are connected in series between lines **352** and **353**. Motor circuit M and overload device OL are together connected in parallel with ironer solenoid IS.

When the ON button is momentarily held closed, relay MS is energerized, closing switches MS_1 and MS_2. Even when the ON button is released, relay MS remains energized. The closing of switch MS_2 causes operation of motor **43** to drive the machine and also causes operation of ironer solenoid IS to permit belt **10** to rise into operative contact with the ironer.

The motor circuit may be opened in three ways. First, the OFF button may be pressed, breaking the circuit of relay MS. Secondly, the overload device OL, through excess current therein or other cause, may be actuated to open switch OL_1, which also breaks the circuit of relay MS. Thirdly, switch TX_1 may be moved from its normal position to its second position to open the circuit of relay MS.

The alarm circuit for opening switch TX_1 is shown in FIG. 23*b*. For convenience of illustration, lines **352** and **353** are shown in FIG. 23*a* as connected to respective terminals *c* and *d*. Terminals *c* and *d* are shown in FIG. 23*b* as connected to further respective alternating current lines **358** and **359**.

Alarm entrance switch AE, alarm setting relay AC and stacker relay switch SR_3 (in the normal position thereof) are connected in series between lines **358** and **359**. It will be recalled that whenever a towel T enters the machine, it closes switch AE. Timer relay T, alarm setting relay switch AC_1 and alarm setting relay switch AC_2 are also connected in series between lines **358** and **359**. Switch AC_2 is connected in parallel with switch AE. Timer auxiliary relay TX and timer relay switch T_1 are also connected in series between lines **358** and **359**.

The operation of the alarm circuit is as follows:

When switch AE is temporarily closed by an entering towel, relay AC is energized, closing switches AC_1 and AC_2. Even when switch AE is opened, relay AC remains energized as long as switch SR_3 is in its normal position. As a result of the closing of switch AC_1 and AC_2, device T is energized. If relay T remains energized for a selected period of time, switch T_1 is closed and relay TX is energized.

Whenever a towel is stacked, switch SR_3 is moved to a second position (as will be explained in detail below), opening the alarm circuit. The alarm circuit is re-set when another towel passes switch AE, because relay T resets instantaneously when its circuit is opened. If no towel is stacked for said selected period of time, as a result of a jamming of the conveyor or other cause, relay TX is energized.

When relay TX is energized, switch TX_1 moves to its second position, stopping the motor. In the second position of switch TX_1, trouble light TL and single stroke bell BL are connected across lines **352** and **353**.

When relay TX is energized, switch TX_2 is also opened. The terminals of switch TX_2 may be connected by lines **360** and **361** to the motor circuit of a feeder conveyor for the machine (not shown), so as to stop the feeder conveyor when switch TX_2 is opened.

The input terminals **362** of full-wave rectifier **363** are respectively connected to lines **352** and **353** (FIG.23*a*). The output terminals **364** of rectifier **363** are connected through fuses **365** to the respective direct current lines **366** and **367**. Resistance **368** and capacity **369** are connected in series between the terminals **364**. Lines **366** and **367** supply the current for the electric control devices for timing mechanism C.

In FIG. 23*a*, relays designated by a first reference letter "A" are part of the "A" timer, and relays designated by a first reference letter "B" are part of the "B" timer.

Towel-length switch X, flip-flop relay switch FF_1 (when flip-flop relay FF is not energized), and timer relay AXR are connected in series between lines **366** and **367**, so that relay AXR is energized while switch X is closed by towel T.

Timer relay switch AXR_1 and timer solenoid ATS_1 are connected in series between lines **366** and **367**. Auxiliary relay switch AAR_2 is connected in parallel with switch AXR_1. Auxiliary relay AAR, normally closed timer relay switch AXR_2 and zero switch AZ are connected in series between lines **366** and **367**. Timer solenoid ATS_2 and auxiliary relay switch AAR_1 are also connected in series between lines **366** and **367**.

Flip-flop relay FF and auxiliary relay switch AAR_3 are connected in series between lines **366** and **367**. Flip-flop relay switch FF_2 and the normally closed "B" auxiliary relay switch BAR_3 are connected in series across switch AAR_3.

The operation of the "A" timer is as follows:

While towel T maintains switch X closed, relay AXR is energized. As a result, switch AXR_1 is closed and solenoid ATS_1 is energized. While switch AZ is closed as soon as the cams begin to turn, switch AXR_2 is open, so that relay AAR is not energized. As soon as towel T leaves switch X, relay AXR is de-energized. Switch AXR_2 closes and auxiliary relay AAR is energized.

With relay AAR energized, switches AAR_2 and AAR_1 close, so that solenoid ATS_1 remains energized and solenoid ATS_2 is also energized. Also, switch AAR_3 is closed so that flip-flop relay FF is energized. Flip-flop switch FF_1 is now thrown to the position in which the "B" timer relay BXR and switch X are connected in series between lines **366** and **367**, relay AXR being now out of circuit. As will become apparent shortly, the "B" timer can now operate.

Relay AAR remains energized until the cams return o their zero positions and switch AZ opens, at which oint the operation of the "A" timer ceases. When relay AR is thus de-energized, switch AAR_3 opens. How-ver, switch FF_2, which was closed as soon as relay FF vas energized, and switch BAR_3 hold relay FF in circuit.

As soon as flip-flop relay FF is energized, the "B" timer s adapted to time the movement of a towel which closes witch X. The "B" timer circuit is quite similar to the A" timer circuit. Solenoid BTS_1 and switch BXR_1 are onnected in series between lines **366** and **367**, with switch AR_1 in parallel with switch BXR_1. Relay BAR, switch XR_2 and switch BZ are connected in series between ines **366** and **367**. Solenoid BTS_2 and switch BAR_2 are lso connected in series between lines **366** and **367**.

The operation of the "B" timer circuit should be ap-arent from the foregoing. When relay BAR is ener-ized, after the re-opening of switch X, switch BAR_3 is pened, de-energizing flip-flop relay FF. The "A" timer s again available for timing the movement of a towel /hich closes switch X.

The control circuit for the transverse folder includes older relay FR, as well as the previously mentioned timer am folding switches AF and BF, folder solenoid FS and older limit switch FL. These parts are shown in the iagram of FIG. 23*a*.

Folder relay FR and switch AF are connected in series etween lines **366** and **367**. Switch BF is in parallel with witch AF. Normally closed switch FL and folder relay witch FR_1 are connected in series across switch AF. Sole-oid FS and folder relay switch FR_2 are connected in eries between lines **352** and **353**.

In operation, when either switch AF or BF is closed y the operating of timing mechanism C, folder relay R is energized. Switch FR_1 is closed, so that relay R remains energized even though said switch AF or F is immediately opened again. Switch FR_2 is also losed, so that solenoid FS is energized, operating the olding mechanism. It will be apparent that when switch L is opened, solenoid FS is de-energized, and the fold-ng action ceases.

For convenience in illustration, the direct current lines 66 and **367** are shown as having respective terminals and *b*. In FIG. 23*c*, these terminals *a* and *b* are shown s being respectively connected to further direct current ines **370** and **371**. FIG. 23*c*, in conjunction with FIG. 18, hows the control devices for the stacking mechanism E and the elevator and pusher mechanism F.

FIG. 18 shows an air line **372** which is adapted to be onnected to a source of compressed air, at a pressure f eighty pounds as an example. The incoming air ravels through water and dirt trap **373**, pressure regulat-ng device **374** (at which the pressure is reduced to ixty pounds as an example) and then oil bath **375**. At his point, some of the air enters branch line **376**, and he remainder of the air passes through perssure device 77 and needle valve **377***a* into branch air line **278**.

Branch air line **378** leads to air cylinder **65**, whose lunger **67** helps to support input conveyor A. Pressure levice **377** is of a type such that the pressure exerted pon the piston of plunger **67** is constant regardless f the position thereof within air cylinder **65**. As a re-ult, when the ironer conveyor (FIG. 3) is lowered t night, input conveyor A is automatically lowered vithout damage thereto. Furthermore, if the ironer con-eyor is raised in the morning, conveyor A is automatic-lly raised. Needle valve **377***a* prevents momentary ressure changes from affecting the position of plunger 7.

Air line **376** leads to further branch lines **379**, **380** and 81 and hence to the various air cylinders previously eferred to (FIG. 23*c*).

Air line **379** leads through respective solenoid-oper-ated valves **382** and **383** to ports adjacent the respective ends of stacker air cylinder **180**. Valve **382** is the stacker "down" valve and is operated by stacker down valve solenoid SDV. Valve **383** is the stacker "up" valve and is operated by stacker up valve solenoid SUV.

Each valve **382** and **383**, as well as each of the other solenoid-operated air valves shown in FIG. 23*c* is a two-position valve and is shown in its normal position in FIG. 23*c*. Each air valve has a conduit **384**, one end of which always communicates with a respective port of its associated air cylinder and the other end of which communicates with its associated air line in one position of the valve and communicates through needle valve **385** with the atmosphere in the other position of the valve.

Valve **383** normally connects air line **379** to air cylinder **180** rearwardly of its plunger piston **386** and hence normally maintains plunger **179** in its forward position in which the stacker is up. The air in front of piston **386** is normally bled to the external atmosphere through valve **382**. It will be apparent that when solenoids SDV and SUV are energized, air enters the front of cylinder **180** from line **379** through valve **382** and is exhausted from the rear of cylinder **180** through valve **383**, so that the stacker moves to its "down" position.

Stacker relay SR, normally open stacker down switch SD and normally closed stacker upper limit switch SUS are connected in series between lines **370** and **371**. are connected in seires between lines **370** and **371**. Solenoids SUV and SDV are connected in parallel with each other and in series with stacker relay switch SR_2 between lines **370** and **371**. Stacker relay switch SR_1 and stacker lower limit switch SLS (in the normal position thereof) are connected in series between line **370** and the end of relay SR which is remote from line **371**.

In operation, when a towel T closes switch SD, relay SR is energized. Although switch SD re-opens immediately, switch SR_1 has first been closed, so that relay SR remains energized. Switch SR_2 is thereby held closed, energizing solenoids SDV and SUV so that towel T is stacked. When switch SLS is moved to its second position, relay SR is de-energized, and the stacker returns to its "up" position. In view of the fact that switch SUS is only closed while the stacker is in its "up" position, solenoid SR cannot be re-energized while the stacker is returning to its "up" position even if the sensitive switch SD accidentally closes.

Totalizing counter relay TC is connected in parallel with solenoids SDV and SUV and is thereby energized once for each stacking operation. Relay TC operates one or more counting devices (not shown) which indicate the total number of towels stacked.

Branch air line **380** leads through respective solenoid-operated valves **387** and **388** to ports adjacent the respective ends of elevator air cylinder **239**. Valve **387** is the elevator "up" valve and is operated by elevator up valve solenoid EUV. Valve **388** is the elevator "down" valve and is operated by elevator down valve solenoid EDV.

Valve **388** normally connects air line **380** to air cylinder **239** rearward of its plunger piston **389** and hence normally tends to maintain plunger rod **241** in its forward position and thereby tends to make the elevator fall. The air in front of piston **389** is normally bled to the external atmosphere through valve **387** (see FIGS. 23*c* and 16).

The other elevator cylinder **240** is filled with hydraulic fluid and serves as a hydro-check for air cylinder and has the usual piston **390** connected to the rear end of rod **241**. Hydraulic line **391** enters cylinder **240** forwardly of piston **390**, and hydraulic line **392** enters cylinder **240** rearwardly of piston **390**. Normally closed high speed valve **393**, whose action is controlled by high speed valve solenoid HSV, is connected between lines

391 and 392. Normally closed valve 394 and constriction 395 are connected in series between lines 391, and 392. Valve 394 is a low speed valve, because of construction 395, and its action is controlled by a low speed valve solenoid LSV.

It will be apparent that the fluid in cylinder 240 prevents the compressed air in cylinder 239 from dropping the elevator unless valve 393 or valve 394 is opened.

Stacker limit switch SLS (in the second position thereof), elevator down switch ED and low speed valve relay LSR are connected in series between lines 370 and 371. Solenoid LSV and low speed relay switch LSR_1 are also connected in series between lines 370 and 371.

When the stacker is in its lowest position, so that switch SLS is in its second position, if the stack of towels is at that time sufficiently high so that switch ED is closed, relay LSR is energized. As a result, switch LSR_1 is closed and solenoid LSV is energized. Although switches SLS and ED are reopened almost immediately, resistance 396 and capacity 397 are connected in series across relay LSR and furnish sufficient time delay to maintain the relay energized for a short time after the switches are re-opened.

While relay LSR is energized and solenoid LSV is thereby energized, low speed valve 394 is open, furnishing a path for the flow of a small amount of fluid from cylinder 240 through line 391 and line 392 and back to cylinder 240. As a result, the compressed air in cylinder 239 from valve 388 and line 380 is active to force rod 241 a short distance forwardly, thereby lowering the elevator slightly. As a result, the elevator is lowered in a series of short steps just enough to provide vertical clearance for stacking towels thereon.

As will be explained in detail below, after a selected number of towels have been stacked, stepper counter switch SC is closed, thereby energizing elevator down relay EDR, which is connected in series with switch SC between lines 370 and 371. The parts associated therewith will now be described.

Elevator limit switch EL (in the normal position thereof) and elevator down relay switch EDR_1 are connected in series across switch SC. Pusher relay PR, elevator down relay switch EDR, normally closed elevator up relay switch EUR_1 and switch EL (in the second position thereof) are connected in series between lines 370 and 371. Relay R is also connected in series with pusher relay switch PR_1 and pusher out limit switch POL (in the normal position thereof) between lines 370 and 371. Elevator up relay EUR, elevator up relay switch EUR_2 and the normally closed elevator upper limit switch EU are connected in series between lines 370 and 371. Relay EUR is also connected in series with switch POL (in the second position thereof) between lines 370 and 371. Solenoids EUV and EDV are connected in parallel with each other and in series with elevator up relay switch EUR_3 between lines 370 and 371. Solenoid HSV and elevator down relay switch EDR_2 are connected in series between lines 370 and 371.

Resistance 398 capacitance 399 are connected in series across relay EDR to provide a time delay in the de-energizing of relay EDR after its current supply circuit is opened.

Branch air line 381 leads through respective solenoid-operated valves 400 and 401 to ports adjacent the respective ends of pusher air cylinder 252. Valve 400 is the pusher "out" valve and is operated by pusher out valve solenoid PFV. Valve 401 is the pusher "return" valve and is operated by pusher return valve solenoid PRV.

Valve 401 normally connects air line 381 to air cylinder 252 rearwardly of its plunger piston 402 and hence normally tends to maintain plunger rod 253 in its forward position. The air in front of piston 402 is normally bled to the external atmosphere through valve 400.

Solenoid PFV and solenoid PRV are connected in parallel with each other and in series with pusher relay switch PR_2 between lines 370 and 371.

In operation, when switch SC is closed and relay EDR is thereby energized, switch EDR_2 is closed, thereby energizing solenoid HSV. Valve 393 is thereby opened, permitting a rapid flow of fluid from cylinder 240 through line 391 and line 392 and back to cylinder 240. As a result, the compressed air in cylinder 239 moves piston 389 and rod 241 rapidly forward and drops the elevator rapidly to its lowest position. When relay EDR is first energized, switch EDR_1 is also closed. Although switch SC opens immediately, relay EDR remains energized while switch EL is in its normal position.

When the elevator reaches its lowest position, switch EL is moved to its second position. Relay EDR remains energized for an instant, because of the time delay caused by resistance 398 and capacity 399, so that switch EDR_3 is held closed long enough for relay PR to be energized. Switch PR_1 is thereby closed, so that relay PR remains energized after switch EDR_3 is opened and until switch POL is moved to its other position.

While relay PR is energized, switch PR_2 is closed, energizing solenoids PFV and PRV. As a result, valves 400 and 401 are operated so that plunger rod 253 is driven rearwardly or outwardly, clearing the stack from the lowered elevator.

At the end of the rearward stroke of pusher plunger 253, switch POL is moved to its second position, energizing relay EUR and de-energizing relay PR. As a result of the de-energizing of relay PR, pusher plunger rod 253 returns to its normal position. At the same time, switch EUR_3 is closed, energizing solenoids EUV and EDV, so that valves 387 and 388 are moved to positions wherein the compressed air from line 380 drives rod 241 rearwardly to raise the elevator. Piston 390 has a one-way check valve 403 which permits rearward movement of piston 390 through the fluid of cylinder 240. It is noted that these movements of the elevator and of the pusher can be simultaneous, because the pusher is located laterally between the two center elevator plates 236. This is a very important capability of my elevator in the time that is saved. By not having to wait for retraction of the pusher to start raising the elevator it is possible to have the elevator in its up position ready to receive the first towel of the next stack without halting the rest of the machine. This is true in spite of the high speed of the machine.

Although switch POL immediately returns to its normal position, switch EUR_2 has first been closed by relay EUR, so that relay EUR remain energized until switch EU is opened.

While relay EUR is energized, switch EUR_1 remains open. It is noted that switch EL remains closed during the outward pusher stroke. Without switch EUR_1, if relay EDR remained sufficiently energized to keep switch EDR_3 closed, relay PR could be energized even when switch POL was moved to its second position, with resultant pumping action of the pusher. However, as mentioned above, as soon as switch POL moves to its second position, switch EUR_1 is open so that relay PR cannot be re-energized.

When the elevator returns to its highest position, switch EU is opened and relay EUR is de-energized.

As has been previously mentioned, step counter switch SC is adapted to be closed by a counting mechanism after a selected number of towels have been stacked. This counting mechanism is shown diagrammatically in FIG. 23*b*.

The mechanism comprises two contact plates 404 and 405 disposed in parallel registration with each other and fixed to a frame (not shown), each said plate being substantially semi-circular and carrying twenty-seven contacts disposed about the periphery thereof. The number

f contacts is illustrative only, and the number can be aried as will become apparent below. The first and ıst contacts are optionally and preferably diametrically pposed.

Said plates **404** and **405** extend transversely to a rotor **06**, which is turnably mounted upon the frame of the ıechanism. Two contact arms **407** and **408**, cam **410** nd ratchet-wheel **409** are mounted upon rotor **406** and re axially spaced from each other. Cam **410** carries a rojection **411** which strikes the movable arm **412** of witch SC once during a revolution of rotor **406** and ıereby moves arm **412** into switch-closing contact with ıe fixed arm **413** of switch SC, switch SC being other-/ise open.

In order to turn ratchet **409** and hence rotor **406**, re-istance **414**, rectifier **415** and solenoid **416** are connected ı series between line **358** and terminal **418**. Resistance **17** is connected in parallel with solenoid **416**. Terminal **18** is connected by switch SR_3 (in the second, non-ormal position thereof) to line **359**. Solenoid **416** is ıereby energized when terminal switch SR_3 is in its ecnd position.

Solenoid arm **419** is supported by the frame upon ivot **420**, which is parallel to rotor **406**. Arm **419** is onnected intermediate its ends to one end of link **421**, he other end of which is connected by spring **422** to the rame. Link **421** carries a detent **423** intermediate its nds. The lower end of arm **419** carries a movable con-act of a switch **424**, the other contact of which is fixed ɔ the frame.

When solenoid **416** is energized, its arm **419** is drawn ɔwards itself against the action of spring **422** and in direction to open switch **424**. When solenoid **416** is e-energized, arm **419** moves in the opposite direction so s to close switch **424** and so that detent **423** engages atchet-wheel **409** and turns it sufficiently to move con-act arms **407** and **408** the distance between successive ontacts on the contact plates. Arms **407** and **408** ırn in a counterclockwise direction, as taken in FIG. 23*b*.

For convenience, the contacts of plate **404** are desig-ıated in FIG. 23*c* by the reference characters R, **0**, **1**, **2**, . . **24**, **25** and will be referred to in the description s C_R, C_0, C_1, C_2, . . . C_{24}, C_{25}. The contacts of plate **05** are designated by the reference characters R, **26**, **27**, . . **49**, **50**, Q and will be referred to in the description s C_R, C_{26}, C_{27}, . . . C_{49}, C_{50}, C_Q:

In plate **404**, contacts C_R and C_{25} are diametrically ɔpposed. In plate **405**, contacts C_R and C_Q are diametri-ally opposed. Also, contact arms **407** and **408** are dis-ɔosed one hundred eighty degrees apart. Thus, when rm **407** makes contact with its associated contact C_R, rm **408** makes contact with contact C_Q. When arm **407** nakes contact with any other contact of plate **404**, arm **08** is out of contact with the contacts of plate **405**.

Contact arms **407** and **408** are connected to each other ɔy lines **425**. Line **425** is connected by line **428** to arm **19**. Contacts C_{50} and C_Q are connected to each other ɔy line **426** and to line **359** by line **427**.

In operation, when no towels have been stacked, otor **406** is positioned so that contact arm **407** engages ontact C_0. As previously mentioned, while the stacker s moving downwardly and until switch SLS is actuated, tacker relay SR is energized. As a result, switch SR_3 s held during this time in its position in which solenoid **16** is energized, and arm **419** is held in a position in vhich switch **424** is open and detent **423** is out of en-gagement with the teeth of ratchet wheel **409**.

When the first towel is stacked and relay SR is de-nergized, arm **419** is released and detent **423** turns atchet wheel **409** so as to move arm **407** to contact C_1. Similarly, when the second towel is stacked, arm **07** moves to contact C_2, and so on. When the twenty-ifth towel is stacked, arm **407** moves to contact C_{25} and arm **408** moves to contact C_R of plate **405**. When the twenty-sixth towel is stacked, arm **408** moves to contact C_{26}, and so on. After the fiftieth towel is stacked, and while contact arm **408** is moving from contact C_{49} to C_{50}, projection **411** brushes against switch arm **412** and momentarily closes switch SC, thereby actuating the mechanism to remove the stack from the elevator, as previously described.

When contact arm **408** makes contact with contact C_{50}, and although switch SR_3 is now in its normal position, an electric circuit is completed from line **358** through resistance **414**, rectifier **415**, solenoid **416**, switch **424**, arm **419**, line **428**, line **425**, arm **408**, line **426** and line **427** to line **359**. As a result, solenoid **416** is energized, moving arm **419** to open switch **424**, whereby arm **408** is moved to contact C_Q. The same circuit is again closed, and arm **407** is returned to contact C_0. The counting mechanism is now in position to count the next stack of towels.

It will be apparent that by tying other contacts to line **359**, it is possible for other contacts to be skipped, so that the stack will be removed after a selected number of towels, other than fifty, have been stacked.

In particular, FIG. 23*b* shows a modifying circuit for stacking the towels in stacks of twenty-five. Contacts C_1, C_3 . . . C_{23}, C_{25}, C_{27}, C_{29} . . . C_{47}, C_{49} are all connected to line **429**, which is connected through manually operable switch **430** (when closed) and line **436** to line **359**. When either contact arm **407** or **408** strikes any one of these contacts, a circuit is completed from line **358** through resistance **414**, rectifier **415**, solenoid **416**, switch **424**, arm **419**, line **428**, line **425**, the contact arm, the contact, line **429**, switch **430** and line **436** to line **359**, so that the contact arm is automaticaly moved to the next contact. Therefore, after twenty-four towels have been stacked, contact arm **408** is located at contact C_{48}. When the twenty-fifth towel is stacked, contact arm **408** moves to contact C_{49} and then automatically to contact C_{50} in the manner just described, closing switch SC. From contact C_{50}, arm **408** automatically moves two positions, as previously described, to return arm **407** to contact C_0.

A manual reset button **431** is provided for returning the counting mechanism to its zero position if it is desired to start a new stack before a complete stack of fifty (or twenty-five) towels has been made. When said button is depressed, it first closes a pair of switch contacts **432** and **433** and then closes a pair of switch contacts **434** and **435**. Contacts **432** and **434** are both connected by line **436** to line **359**. Contact **433** is connected by line **437** to line **429**. Hence the closing of contacts **432** and **433** is equivalent to the closing of switch **430**.

Contacts C_2, C_4 . . . C_{22}, C_{22}, C_{24}, C_{26}, C_{28} . . . C_{46}, C_{48} are all connected to line **438**, which is connected to contact **435**. Therefore, when contacts **435** and **434** are closed, and when either contact arm **407** or **408** strikes any one of these contacts, a circuit is completed from line **358** through resistance **414**, rectifier **415**, solenoid **416**, switch **424**, arm **419**, line **428**, line **425**, the contact arm, the contact line **438**, contacts **435** and **434** and line **436** to line **359**, so that the contact arm is automatically moved to a contact connected through lines **437** and **438** to line **358**. As a result, arm **407** and **408** are automatically moved through all of these positions, closing switch SC, until arm **407** returns to contact C_0. This contact is not connected to the reset switches, so that arms **407** and **408** remain in their zero position until relay SR is energized and the first towel of a new stack is stacked.

Summary of operation

The mode of operation of the various parts has been fully described in the course of the previous detailed description of the machine. At this point, therefore, the over-all operation of the machine will be only briefly described.

The ON button is pressed to start the motor. Towel T moves from ironer conveyor belt **85** to input conveyor belts **79** and **80**. The latter belts preferably travel much faster than belt **85**, but sufficient friction is applied by roller **84** so that towel T is pulled up the incline or input conveyor A by the belts thereof.

From input conveyor A, towel T travels into the main machine between belt **10** and plate **100** and into longitudinal folder B, at the same time depressing alarm entrance switch AE. If a towel is not stacked by stacking mechanism E in fifteen seconds, for example, the alarm mechanism is actuated and the machine stops.

In longitudinal folder B, one side portion of towel T is folded under main plate **100** by folding plate **109**, and the other side portion of towel T is folded under plate **109** by the second folding plate **110**. Towel T, therefore, leaves longitudinal folder B folded longitudinally roughly into thirds. While the folded-under portions of towels T may vary in width, the central portions are all of the same width, which is governed by the width of plate **100**.

Towel T then passes around change-of-direction roller **11** and then rides on the upper face of belt **10**. Towel T passes under and in operative contact with ironer plate **122** (ironer solenoid IS having been energized to raise rod **13** when the motor was started).

Towel T then reaches switch lever **14** and holds towel-length switch X closed during the time that it passes between belt **10** and lever **14**. If it be assumed that the flip-flop relay FF is not energized, so that the "A" timer is in operation, relay AXR is energized while switch X is closed, as a result of which solenoid ATS_1 is energized and cams **328** and **329** turn from their zero positions at half their full speed (the time required for the cam **328**, turning at full speed, to move from its zero position to the point of closure of towel folding switch AF being equal to the time required for a point on belt **10** to move from switch X to the transverse folding position). After towel T leaves switch X, auxiliary relay AAR is energized, both solenoids ATS_1 and ATS_2 are energized and cams **328** and **329** turn at full speed. Relay AXR is de-energized and flip-flop relay F is energized, making it possible for the "B" timer to time the movement of the next towel. Cams **328** and **329** continue to turn until switch AF is closed, at which time the center of towel T is at the transverse folding point, and then continue to turn until they return to their zero positions.

When switch AF is closed, folding solenoid FS is energized and operates folding mechanism D to fold towel T transversely and to force towel T between roller **15** and tension roller **28**, against the lower face of belt **10**. When the moving mechanism closes folder limit switch FL, solenoid FS is de-energized and the mechanism returns to its normal position.

Towel T is next carried between belt **10** and plate **153** to stacking mechanism E, where the towel is supported by angle irons **178** and is moved frictionally by pulley belts **170**. When towel T strikes stacker down switch SD, stacker solenoids SDV and SUV are energized, operating air valves **382** and **383** to admit compressed air to air cylinder **180** in a direction such as to drive plunger **179** outwardly to move irons **178** out of the downward path of towel T. Simultaneously, tamping plate **195** is pushed downwardly against towel T to force it onto stack **17**. When the stacker actuates stacker lower limit switch SLS, the solenoids SDV and SUV are de-energized, so that the action of valves **382** and **383** is reversed and the stacker returns to its normal position. The stack **17** is supported by elevator plates **236**, which are in their highest position at the start of the stack. The movement of plates **236** depends upon the movement of rod **241**, which serves as the common plunger rod for air cylinder **239** and hydraulic cylinder **240**. Normally, the air valves **387** and **388** for cylinder **239** are positioned to admit compressed air into cylinder **239** in a direction so as to tend to move rod **241** to lower plates **236**. This action is normally resisted by the pressure of the hydraulic fluid of cylinder **240** upon plunger rod piston **390**.

When elevator down switch ED of the downwardly moving stacker plate **195** strikes the top towel of the stack (the stack having risen too high), low speed valve relay LSR is energized. As a result, hydraulic valve **394** is opened to permit a small flow of fluid between the ends of cylinder **240**, making it possible for rod **241** to move slightly and lower plates **236** slightly.

Every time that a towel is stacked, the step counting mechanism is turned one step. After fifty towels have been stacked, the step counting mechanism is automatically turned back to its starting position. In moving from the forty-ninth to the fiftieth step, the step counting mechanism closes switch SC. High speed valve solenoid HSV is thereby energized, opening valve **393** and permitting a rapid flow of fluid between the ends of cylinder **240** so that the elevator drops rapidly to its lowest position. At this point, elevator lower limit switch EL is actuated, and pusher relay PR is thereby energized. Pusher plate **18** is forced in a direction to clear the stack from the elevator and to close pusher outer limit switch POL. Relay PR is de-energized, so that the pusher returns to its initial position; and solenoids EUV and EDV are energized to turn valves **387** and **388** to positions resulting in movement of rod **241** to return the elevator to its highest position. At this point, elevator upper limit switch EU is opened and solenoids EUV and EDV are de-energized.

Modification of stacker mechanism

In the stacker mechanism, as shown in detail in FIGS. 12–15, tamping plate **195** extends laterally between pulley belts **170**. It will be recalled that when angle irons **178** are turned downwardly and outwardly, releasing towel T, plate **195** is driven downwardly against towel T to force it upon stack **17**. When the stack rises high enough, plate **195**, in driving a towel downwardly, tamps the stack against the top edges of elevator plates **236** (at the same time closing switch ED).

Of necessity, plate **195** is narrower than towel T, as shown in FIGS. 13 and 15, so that only the longitudinal center portion of stack **17** is tamped. This sometimes results in curling of the sides of the stack and even in overturning of an untamped towel side portion.

Accordingly, a modified mechanism is shown in FIGS. 24 and 25.

FIGS. 24 and 25 show a plate **195***a* which is similar to and operates in the same manner as plate **195**. However, plate **195***a* is narrower than plate **195**.

Brackets **480** are fixed to plate **195***a* and extend above and laterally outwardly thereof, said brackets **480** being located on each side of plate **195***a* and forwardly of the front levers **203** and rearwardly of the rear levers **203**. Each bracket **480** is channel-shaped and has lateral end plates extending outwardly of a longitudinal connecting plate.

A transverse lever **481** is positioned between the lateral arms of each bracket **480**, said lever **481** having a pair of ears **482** which are turnably mounted on a longitudinal pivot shaft **483** supported by said lateral bracket arms. The lower ends of the levers **481** on each side of plate **195***a* are respectively connected to a longitudinal plate **484** which is longitudinally co-extensive with plate **195***a*. Plates **484** extend laterally outwardly of levers **481**. Each bracket **480** has a projection **485** at its lower end which is connected by spring **486** to the top of lever **481**, so that plates **484** are urged laterally outwardly.

Brackets **487** are mounted upon frame **1** laterally outwardly from and in lateral alinement with the respective levers **481**. Each bracket **487** has an idler cam roller **489** mounted on its lower end by means of longitudinal

pivot **488**. Said cam roller **489** rides upon the outer face of lever **481**.

In the "up" position of the stacker, levers **481** respectively extend substantially vertically upwardly from points on an approximate level with and laterally just outside plate **195***a*, said levers **481** having upper end portions **490** which diverge upwardly and outwardly to the respective pivots **483**. Preferably, plates **484** slope slightly downwardly from their inner ends. The outer ends of plates **484** are located inward from pulley belts **170** and outward from and above the inner ends of angle iron arms **177**, with the inner ends of plates **484** close to plate **195***a*.

While the stacker is moving to its "down" position, cam rollers **489** ride upon levers **481**, which drop substantially vertically, angle iron arms **177** being moved out of the path of descent of plates **484**. Just before plate **195***a* reaches its lowest position, cams **489** ride upon lever portions **490**, permitting plates **484** to swing outwardly to their broken line positions of FIG. 24. Plates **484** are now approximately in the same plane as plate **195***a* and remote from plate **195***a* and extend outwardly substantially to the side edges of towel T. Therefore, when stack **17** is tamped, it is tamped at its center and also at its sides.

While I have disclosed a preferred embodiment of my invention and have indicated various changes, omissions and additions which may be made therein, it will be apparent that various other changes, omissions and additions may be made without departing from the scope and spirit of the invention.

I claim:

1. A conveyor for articles of linen and the like, comprising a frame, a plurality of magnets fixed to said frame, a continuous conveyor belt, a longitudinally extending ferromagnetic first plate positioned below said belt having a rear inlet end and a forward outlet end and means attaching it to said frame at its inlet end, said plate being flexible and resilient and being free of said frame forwardly of said attaching means, said magnets being positioned and adapted to support and hold said plate upwardly so as to engage said belt frictionally and slidably upon the upper face of said first plate, whereby said conveyor carries articles forwardly between said belt and said first plate.

2. A conveyor in accordance with claim **1**, said conveyor also comprising second upper and third lower longitudinal folding plates positioned below said first plate and respectively mounted at side edges of the first plate on said frame laterally outwardly of the first plate and overlapping the bottom face thereof, each folding plate having mounted and unmounted side edges and a rear portion which is rearwardly inclined towards the mounted side edge thereof and extends beyond the first plate side edge proximate to said mounted side edge, the rear mounted end of said folding plates being located forwardly of the rear mounted end of the other side edge, whereby first one side portion of an article overlapping the second plate and then the other side portion thereof is folded under the portion thereof which is on said first plate.

3. Apparatus for folding articles of linen which comprises an elongated support plate for said articles of linen having a width less than the width of said articles, conveyor belt means located above said support plate and adapted to frictionally engage the upper surfaces of said articles and move the articles along the support plate, folding means for folding a portion of a said article extending beyond an edge of said support plate under the plate, support means for supporting said support plate ahead of the region of said folding, and magnetic means positioned above said conveyor belt means for holding the support plate upwardly in the region of said folding and thereby hold a said article in frictional engagement with the conveyor belt means.

4. Apparatus in accordance with claim **3** in which said support plate is a magnetic material, said magnetic means comprising a plurality of magnets longitudinally spaced along the support plate.

5. Apparatus in accordance with claim **3** including a plate of non-magnetic material mounted above said conveyor belt means and closely adjacent thereto to thereby limit upward movement of the conveyor belt means in said folding region.

6. Apparatus in accordance with claim **3** including means for longitudinally removing folded articles from said support plate.

7. Apparatus for folding articles of linen which comprises an elongated smooth support plate of magnetic material for said articles, the width of said support plate being less than the width of a said article whereby a portion of the article extends down over at least one edge of the support plate, conveyor belt means located above said support plate and adapted to frictionally engage the upper surfaces of said articles and move the articles along the support plate, at least one folding plate mounted below said support plate in spaced substantially parallel relationship therewith for folding a downwardly extending portion of a said article under the support plate, support means for supporting the input end of said support plate, magnetic means positioned above said conveyor belt means for holding the support plate upwardly in the region of said folding and thereby hold a said article in frictional engagement with the conveyor belt means, and means for longitudinally removing folded articles from the output end of said support plate.

8. Apparatus in accordance with claim **7** including a smooth plate of non-magnetic material mounted above said conveyor belt means and closely adjacent thereto, said magnetic means comprising a plurality of magnets longitudinally spaced along said non-magnetic plate for holding said support plate upwardly and thereby hold a said article in engagement with the conveyor belt means and the conveyor belt means in engagement with said non-magnetic plate.

9. Apparatus in accordance with claim **3** including conveyor belt means for receiving folded articles from said support plate, ironing means positioned in the path of travel of the folded articles for ironing the folds therein, and means in the path of travel of the ironed articles for transversely folding each article.

10. Apparatus for moving articles of linen and the like which comprises a support plate of magnetic material for said articles, conveyor belt means located above said support plate and adapted to frictionally engage the upper surfaces of said articles and move the articles along the support plate, support means for supporting said support plate remote from an end thereof, and magnetic means positioned above said conveyor belt means for holding the support plate upwardly in the region between said support means and said end and thereby hold a said article in frictional engagement with the conveyor belt means.

11. Apparatus in accordance with claim **10** in which said magnetic means comprises a plurality of magnets spaced along the support plate.

12. Apparatus in accordance with claim **10** including a plate of non-magnetic material mounted above said conveyor belt means and closely adjacent thereto in the region between said suport means and said end to thereby limit upward movement of the conveyor belt means in said region.

13. Apparatus for folding pre-ironed articles of linen which comprises conveyor belt means for conveying said pre-ironed articles along a predetermined path of travel, means in the path of travel of said pre-ironed articles for longitudinally folding each article with respect to the direction of travel thereof, ironing means in the path of travel of the longitudinally folded articles on said conveyor belt means and positioned thereabove for ironing the folds therein, and means in the path of travel of the

longitudinally folded and ironed articles on said conveyor belt means for transversely folding each article.

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